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Water Supply, Waste Disposal and Water Pollution

Town of Cobourg and Adjacent Areas

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Report on water supply, waste disposal and water pollution in the town of Cobourg and adjacent areas of the township

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Environment Ontario

MINISTRY OF THE ENVIRONMENT

REPORT ON

WATER SUPPLY, WASTE DISPOSAL AND WATER POLLUTION

IN THE

TOWN OF COBOURG

AND

ADJACENT AREAS

OF THE

TOWNSHIP OF HAMILTON

COUNTY OF NORTHUMBERLAND

SANITARY ENGINEERING BRANCH

DISTRICT ENGINEERS SECTION

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I INTRODUCTION

On June 15, 1971, field investigations were initiated by staff of the Ontario Water Resources Commission in the Town of Cobourg and in the adjacent areas of the Township of Hamilton. The purpose of these investigations was to assess the water quality of the local watercourses and the nature of waste flows into these watercourses. Surveys of this type are made to ensure a satisfactory water quality for the many various water uses made by the people of the Province.

The field investigations provide data on conditions in the municipality, ie. water quality information, location and sources of contamination, and the areas requiring sanitary services. Investigations of this type allows the Provincial Government to guide the local authorities in ways to protect and preserve their streams and rivers.

In 1959, the Ontario Water Resources Commission released a report on water pollution in the Town of Cobourg and in the Township of Hamilton. There were many problems noted in the report. In 1961 a review of the initial survey conducted in 1959 was made. The problems noted in the Township of Hamilton in 1959 had been corrected but many problems remained to be corrected inside the Town of Cobourg. A period of twelve years has passed since the last pollution survey was released. The problems noted in 1959 have been reviewed with the Town of Cobourg during the interim and many of the problems have been corrected.

The samples collected during the field investigations were submitted to the Ontario Water Resources Commission laboratory in Toronto for analyses and examination.

Discussions were held with various local officials and residents in the area. Their co-operation and assistance was most appreciated.

In the body of the report, comments are made relating to "Drinking Water Objectives" and "Guidelines and Criteria for Water Management"; a copy of these references have been enclosed in the pocket at the back of this report.

II COBOURG (T.) and HAMILTON (TWP.)

A. General

The Town of Cobourg sits on the north shore of Lake Ontario approximately half way up between the cities of Kingston and Toronto. The town is surrounded on three sides by the Township of Hamilton.

In 1850 Cobourg was incorporated as a town, at that time the population was approximately 3,870. During the past 120 years the population has grown to over 10,700.

The Cobourg-Hamilton Township area lies in the centre of a developing economic region known as the Diamond Triangle. Easy access to the Kawartha Lakes tourist area is one of the many features which makes this a desirable area to live in.

B. Physical Features

The Town of Cobourg and adjacent areas of the Township of Hamilton lie on the lake plain of glacial Lake Iroquois. The level of Lake Ontario is approximately 245 feet above sea level. The land rises from the present lake level to over 1,000 feet sixteen miles north of the lake. The old shoreline of Lake Iroquois is very irregular in the area north of Cobourg. In many places the exact boundaries have not been identified. A map on page 7 shows the surficial geology of the Cobourg-Hamilton Township area. The area around Cobourg is made up of glacio-lacustrine deposits in the form of a lake plain. There are many large drumlins which have steep faces due to the wave action on Lake Iroquois. The type of soil varies throughout the area from sand to silt and clay. Generally, the sandy areas are west of the Town. Along Lake Ontario in the east end of Cobourg and stretching into Hamilton Township, is a ground moraine deposit

of mainly sandy till.

The stream bed of Cobourg Brook formed a spillway during glacial times in the upper reaches of the present watercourse. A serpent-like bed of silt and mud cuts across the lake plain and forms the lower section of Cobourg Brook.

C. Drainage Systems

There are three main watercourses in the Town of Cobourg: the "Town Watercourse", Cobourg Brook and Brook Creek. The map on page 7 shows the watersheds of these watercourses. The "Town Watercourse" is a local name for a small drainage course which originates just north-east of the Town of Cobourg boundary. It flows in a south-westerly direction until it crosses Division Street, then it generally parallels Division Street and empties into Lake Ontario at the harbour. In the centre of the town much of the watercourse is covered. The "Town Watercourse" drains an area of approximately 7 square miles. There are many storm sewers directed to this watercourse. The majority of the storm water collected in the town finds its way to this watercourse.

Cobourg Brook has its headwaters in Concessions 6 and 7, Township of Hamilton and Concession 7, Township of Haldimand. The Cobourg Brook watershed encloses an area of approximately 40.7 square miles. Cobourg Brook is the largest of the three watercourses. There are several small communities along this watercourse. Cobourg Brook flows through the west end of Cobourg and empties into Lake Ontario approximately 1/2 mile west of Cobourg Harbour. Within the confines of the town, cooling waters from General Foods and General Wire & Cable Limited are discharged to Cobourg Brook. The municipal sewage treatment plant also discharges

COBOURG BROOK

B

45

TWP.

MILL VALLEY

HALDIMAND

A

COLDSPRINGS

TWP.

HAMILTON

CREEK

45

A

BALTIMORE

BALTIMORE

401

BROOK

PRECIOUS CORNERS

A

45

COBOURG

TOWN

A

LIMIT

TOWN

LIMIT

C.N.R.

C.P.R.

2

401

C O B O U R G

PUMPHOUSE

2

B

ONTARIO

C.P.R.

C.N.R.

W.P.C.P.

LAKE

LEGEND

WATERSHED BOUNDARY

TOWNSHIP BOUNDARY

SURFICIAL GEOLOGY

GLACIAL DEPOSITS

GROUND MORAINE

DRUMLIN

GLACIO-FLUVIAL DEPOSITS

INTERLOBATE KAME MORAINE

OUTWASH PLAIN

SPILLWAY

GLACIO-LACUSTRINE DEPOSITS

BEACH

LAKE PLAIN (A-SAND, B-SILT & CLAY)

POND & ORGANIC DEPOSITS

SWAMP, MUCK

FIG. I

WATERSHEDS AND SURFICIAL GEOLOGY OF COBOURG BROOK AND ADJOINING CREEKS

DRG. Nº 72-26 DE

its effluent to Cobourg Brook just north of King Street.

A stream flow station has been established at the bridge adjacent to the sewage treatment plant. Records are available of the stream flows since October of 1966. The stream flow varies between the spring runoff maximum of 273 cu. ft. per second and a summer minimum of 11.5 cu. ft. per second. Stream flow measurements are usually taken at least once a month and represent the actual flow at the particular time the recording is made. As a result, it is expected that the actual maximum and minimum flows are beyond the range indicated here. Table I summarizes the flow records at this location for the past three years.

Brook Creek originates in the Second Concession of the Township of Hamilton. It flows in a southerly direction to the Town of Cobourg's eastern boundary and then parallels the boundary and enters Lake Ontario approximately 1/8 of a mile east of the town. Brook Creek drains an area of approximately 5 square miles. Only a small portion of the Brook Creek watershed lies in the Town of Cobourg.

D. Water Supply

The principal water supply system in this area is operated by the Cobourg Public Utilities Commission. There is one private water works system at Baltimore which will eventually serve 28 homes and be operated by the Township of Hamilton. The remainder of the residents must rely on their own resources to acquire a water supply either from ground waters or surface waters. The Town of Cobourg water supply is obtained from Lake Ontario while the Baltimore supply is obtained from ground water sources through a drilled well.

TABLE I - STREAM FLOWS*

COBOURG BROOK

AT SEWAGE TREATMENT PLANT

1971

DATE	FLOW	DATE	FLOW	DATE	FLOW
Mar. 29	43.5	June 21	27.5	Sept. 27	27.8
Apr. 13	37.7	June 24	35.1	Oct. 12	29.3
Apr. 27	87.5	July 5	25.0	Oct. 26	45.0
Apr. 28	85.0	July 18	23.0	Oct. 28	35.1
May 13	48.9	July 23	32.3	Nov. 18	26.0
May 25	34.1	Aug. 17	23.9	Nov. 24	23.4
June 1	31.5	Aug. 19	39.3	Dec. 8	46.9

1970

DATE	FLOW	DATE	FLOW	DATE	FLOW
Mar. 16	45.6	May 28	42.9	Sept. 1	34.7
Mar. 24	118	June 3	28.6	Sept. 9	32.0
Apr. 7	10.8	June 11	32.6	Sept. 28	34.7
Apr. 15	62.2	July 7	24.1	Oct. 6	31.3
Apr. 29	46.3	July 9	19.1	Nov. 3	39.3
May 13	38.2	Aug. 7	15.0	Nov. 12	89.7

1969

DATE	FLOW	DATE	FLOW	DATE	FLOW
June 21	42.8	May 14	66.8	Sept. 17	27.1
Feb. 20	65.0	May 21	41.0	Oct. 1	14.1
Mar. 4	44.5	June 5	44.4	Oct. 7	16.7
Mar. 24	65.0	June 19	45.8	Oct. 16	33.1
Apr. 14	43.0	July 15	18.0	Oct. 30	32.5
Apr. 24	84.2	Aug. 14	11.5	Nov. 18	24.9
May 6	40.0	Sept. 16	14.1		

* Stream flows reported in cfs

The Cobourg filtration plant supplies water to the majority of homes in Cobourg and to the adjacent areas of the Township of Hamilton. The filtration plant is located on Lake Ontario at the foot of Darcy Street in the east end of Cobourg. The filtration plant was originally built in 1949. The present filtration plant has a capacity of 8 million gallons per day. A report by the consulting engineering firm, Totten, Sims, Hubicki & Associates Limited, has recommended that the treatment capacity be upgraded to 12.5 million gallons per day by 1978.

Raw water is withdrawn from Lake Ontario through a 25-inch diameter steel intake which extends approximately 800 feet off shore. There is approximately 10 feet of water above the intake structure. A new intake presently under construction will be 42 inches in diameter and will draw water from a depth of approximately 20 feet. In the intake well the raw water flows through a travelling screen and through low lift pumps where chlorine dioxide is added for disinfection and taste and odour control. From this point the water can be directed to the suspended solids contact clarifier (reactivator) or can by-pass this unit and flow directly to the filters. In the re-circulation chamber of the reactivator liquid alum is added to form a floc suitable for clarifying the raw water. The effluent from the suspended solids contact clarifier flows by gravity to filters. The effluent from the filters is chlorinated on the discharge side of the high lift pumps before the water is discharged to the storage reservoir and to the distribution system.

Raw Water Quality

A raw water sampling program is carried out by staff of the Cobourg PUC. Samples are submitted to the Ontario Water Resources Commission laboratories in Toronto for chemical analyses and bacteriological examination. During

the past year a great improvement has taken place in the sampling program.

Chemical Quality

A summary of the chemical samples of the raw water analysed in 1971 indicate the following concentrations:

CHEMICAL ANALYSIS	CONCENTRATION *
Hardness	139
Alkalinity	99
Iron	0.21
Chloride	30
pH	8.2
Colour	-
Turbidity	5

*concentrations reported in ppm except pH, colour and turbidity

The chemical results for 1971 have been included in Appendix A of this report in Table V. The colour reading of the raw water was 5 colour units or less. For this reason no value was given in the above summary.

In Table VI a summary of the chemical results for the past five years has been presented. The results indicate no dramatic change in water quality. The 1971 results do not differ greatly from the previous years.

Bacterial Quality

During 1971 a total of 51 bacteriological samples were collected of the raw water. A monthly geometric mean was calculated of the 1971 results. Bacterial distributions in nature are best described by exponential rather than arithmetical summaries. Geometric means were used to summarize the monthly

counts. Table II shows the results of these calculations. The bacterial quality of the raw water exceeded our desirable criteria in all months except May but all the results are within our permissible criteria limits.

TABLE II - BACTERIAL WATER QUALITY

RAW WATER SAMPLES

COBOURG WATER WORKS

MONTH	*BACKGROUND COLONIES	* COLIFORM BACTERIA
January	-	-
February	11,450	957
March	483	209
April	3,919	637
May	1,718	64
June	13,230	177
July	6,842	258
August	44,380	1,064
September	103,600	641
October	13,700	153
November	7,155	335
December	5,418	326

NB. The individual results have been tabulated and are available in Table VII in Appendix A.

* Number of organisms per 100 mg per litre of sample

In the Cobourg area, the predominant west and north-westerly winds generate an upwelling of lake waters along the shoreline. During other wind conditions, lake surface circulation results in currents from west to east 25 per cent of the time and from east to west 30 per cent of the time. Thus, the water quality of the three watercourses could have an adverse effect on the raw

water quality at the water filtration plant. This is reflected in the results of the raw water sampling program. During the first 6 months of 1972 there has been a great improvement in the raw water quality. This is no doubt due in part to the improved disinfection at the sewage works and the high water levels in the lake.

Treated Water Quality

Chemical Quality

The treatment process at the filtration plant generally reduces the turbidity and colour to acceptable levels. The objectives for treated water quality, (physical quality objectives) suggest that "drinking water should contain no impurities which would cause offense to the sense of sight, taste, or smell". Generally the following limits* should not be exceeded:

Turbidity	-	1 unit
Colour	-	5 units

* See pamphlet entitled "Drinking Water Objectives" enclosed in the pocket at the back of the report.

The results of colour and turbidity readings of the treated water samples submitted to the Ontario Water Resources Commission laboratories in Toronto during 1971 are summarized below.

TABLE III - COLOUR - TURBIDITY

TREATED WATER QUALITY

COBOURG WATER WORKS

DATE (d/m)	APPARENT COLOUR	TURBIDITY UNITS
27/1	L 5	1.5

DATE (d/m)	APPARENT COLOUR	TURBIDITY UNITS
22/2	L 5	1
23/3	L 5	8
20/4	L 5	1
17/5	5	1
14/6	L 5	1.5
12/7	L 5	3
9/8	L 5	1.5
28/9	L 5	1.5
30/11	L 5	1.5

L - Less than

Since up to the present time reliable readings could only be obtained down to 2 Jackson turbidity units, the results of the turbidity readings above are considered to be generally within our objectives. More sensitive methods of turbidity measuring have been developed and will be shortly introduced at the Ministry of the Environment laboratories.

Bacterial Quality

A bacteriological sampling program of the treated waters is maintained by the Cobourg PUC. This is supplemented by samples collected by the Haliburton, Kawartha, Pine Ridge District Health Unit. Results of the 1971 bacteriological sampling program indicate that the treated water was generally satisfactory. Table VIII in Appendix A shows a monthly summary of the results. All samples collected, except for one doubtful reading in March,were satisfactory.

Baltimore Heights Water Works

The Baltimore Heights Water Works is located in Concession II, Lot 8 of the Township of Hamilton. The water works supplies water to a subdivision

still under development. At the present time there are 13 houses built. Ultimately the subdivision is expected to contain 28 homes. Work on the water works was started in 1970.

The water works obtains water supply from a 6-inch diameter drilled well which has a rated capacity of 30 gpm. There has been some problems with silt and sand in the water. This problem is under investigation. Chlorination is the only treatment provided at the present time.

Chemical Quality

Some extreme fluctuations in the iron, colour,and turbidity content of the water have been noted. The analyses shown below are the results from two samples collected in February of this year.

TABLE IV - CHEMICAL WATER QUALITY

BALTIMORE HEIGHTS WATER WORKS

*ANALYSIS	SAMPLE LOCATION	
	AT WELL	DISTRIBUTION SYSTEM
Hardness	168	168
Alkalinity	199	198
Iron	1.7	0.2
Chloride	5	5
pH at Lab	7.9	7.6
Apparent Colour	30	10
Turbidity	25	3

* Concentrations reported in ppm except pH, colour and turbidity

The developer has retained a hydrologist to study and report on the problem of sand in the water.

Bacterial Quality

The bacterial quality of the raw water during the first two months of 1972 showed the need for disinfection. As a result, chlorination treatment on a continuous basis has been initiated. The bacterial quality of the treated water has been satisfactory.

E. Waste Disposal

Sewage Treatment and Disposal

There is only one municipal sewage treatment plant and collection system in this area. It serves the Town of Cobourg and provides secondary degree treatment. In the remaining areas, the disposal of sanitary wastes is achieved through individual subsurface disposal systems.

The sewage treatment facilities serving the Town of Cobourg have recently been expanded and upgraded. Most of the new facilities were placed in operation in mid-June 1972. In the past the Cobourg sewage treatment plant used the bio-filtration process following primary treatment to render the waste suitable for discharge. The new facilities more than doubles the capacity to 3.53 MGD and changes the secondary treatment process from bio-filtration process to the activated sludge process.

For the past several years the sewage treatment plant had been hydraulically and organically overloaded. This has caused frequent discharges of raw sewage to Cobourg Brook by overflows from the inlet sewer to the plant.

The old sewage works was originally designed to serve a population of 12,000 but large volumes of high strength wastes from several wet industries helped to overload the system. The town's sewer use by-law has not been vigorously enforced

in the past. The municipal officials should ensure that the sewer use by-law is enforced to prevent shock loadings on the sewage treatment works which may overload the sewage treatment works.

The quality of the effluent from this sewage treatment plant has exceeded our objectives for many years because of overloaded conditions. Proper disinfection facilities were not included in the original plant design and thus disinfection of the final effluent has not been very successful. The new facilities include effluent chlorination which should provide adequate disinfection of the final effluent. During the previous years the effect of the effluent was reflected in the unsatisfactory quality of Cobourg Brook below the sewage treatment plant. A monitoring station is located on Cobourg Brook at King Street just below the sewage treatment plant outfall. The dissolved oxygen levels in the creek at this point during the past three years were as follows:

	*MINIMUM	*MAXIMUM	*AVERAGE
1971	2.0	13.0	6.7
1970	5.0	12.0	8.3
1969	1.0	11.0	7.2

*concentration in mg per litre

These tests are made once a month. It should be noted that this location does not necessarily represent the area where the sewage treatment plant effluent has its maximum effect. It is expected that the lowest oxygen depression in the stream will occur downstream of King Street. The poor water quality in Cobourg Brook reflects not only the effect of the sewage treatment effluent but also problems upstream.

The water quality of Cobourg Brook has improved to date in 1972 as a result of changes in treatment facilities. The water quality should continue to improve as additional units of the newly converted plant become operational.

Bacterial samples collected from Cobourg Brook on June 29, 1972 show that the water quality has improved significantly. The laboratory results are summarized below.

*SAMPLE POINT	**TOTAL COLIFORM	**FECAL COLIFORMS	**FECAL STREPTOCOCCUS
CB-1	3000	100	L 100
CB-3	210	40	10
CB-4	L 100	L 100	L 100
CB-6	4000	500	600
CB-16	4000	460	160
CB-18	550	200	240
CB-20	3200	300	200

L - less than

* For a description of sample point locations see Table X in Appendix B

** Number of organisms per 100 mg per litre of sample

During the first five months of 1972, the water quality of Cobourg Brook at King Street has improved considerably. The minimum dissolved oxygen level recorded was 8.1 mg per litre and the maximum dissolved oxygen level was 12.4 mg per litre.

A statistical analyses of the effluent quality from single-stage high rate trickling filters shows that the best 5-day BOD removals occur in the summer months and the poorest in the winter months. The suspended solids removal efficiency is usually best in late fall. The advantage of the activated sludge process now being used at Cobourg is that this process shows very little seasonal variation in effluent quality. There is some falloff in the BOD effluent quality in the late fall as the micro-organisms are climatized to the cooler weather but generally the effluent quality remains very consistent.

Private Domestic Waste Disposal

There are some waste disposal problems in the developed areas around the Town of Cobourg which presently employ septic tank systems to dispose of sanitary wastes. In the less developed areas of the Township of Hamilton there have been few reports of any waste disposal problems.

On the east side of Cobourg where many problems have occurred, soil conditions are not ideal for sub-surface disposal. The surficial geology of the region (see Figure I) indicates the presence of glacio-lacustrine deposits of silt and clay. Recent soil borings taken in the area along Highway #2 east of Brook Creek shows the area to approximately five feet of clay and silt. There is a small wedge-shaped area of sandy till lying along Lake Ontario. Soil borings in this area shows stony, sandy, silt till deposits. These deposits vary from five feet to eleven feet or more in depth. This type of soil should have good properties for septic tank development but problems have developed because of a high water table in some areas. A municipal collection system is therefore required in the area along the eastern boundary of the Town of Cobourg if these sewage disposal problems are to be corrected. In developed areas of the township just north of Cobourg and on the west side of Cobourg, septic tank systems appear

to be working successfully at the present time.

Industrial Waste Disposal

In the Town of Cobourg and the adjacent areas of the Township of Hamilton considered in this report, all industrial sources of waste except cooling water are discharged to the municipal sewage collection system of the Town of Cobourg.

In the Town of Cobourg, industries contribute a significant proportion of the wastes directed to the sewage treatment facilities. Most of the industries having toxic wastes and/or physical properties which can cause problems in the collection system and at the sewage treatment plant, have installed pre-treatment facilities. The only major industry still requiring additional pre-treatment facilities is Robson-Lang Leathers Limited. At the present time the Robson-Lang Leathers Limited is discussing with the Town of Cobourg pre-treatment requirements and waste loading costs for the discharge of their waste to the sanitary sewage collection system.

Solid Waste Disposal

There are no solid waste disposal sites in operation at the present time in the Town of Cobourg. A waste disposal site in the Township of Haldimand approximately five miles east of Cobourg is used by the Town. The Township of Hamilton has a solid waste disposal site near Baltimore in Lot 8, Concession 3. In previous years, investigations have been made by the Ontario Water Resources Commission at both sites because of water pollution complaints.

The solid waste disposal site in the Township of Haldimand was built over a local watercourse which had been enclosed in a conduit. At the time of the OWRC investigations leachate from the disposal site was gaining direct access to the watercourse through cracks in the conduit. Repairs to the conduit were made by the Town of Cobourg.

The solid waste disposal site in the Township of Hamilton at Baltimore was investigated originally by OWRC staff and found to be posing a potential pollution threat to a branch of Brook Creek near its headwaters. A berm was constructed between the solid waste disposal site and the watercourse to prevent direct leaching from the site.

At the present time staff of the Waste Management Branch, Ministry of the Environment, is supervising control over improvements to the sites, to prevent further problems from occurring. Samples collected by the Waste Management Branch staff indicate that repairs to the conduit has corrected the problem at the Cobourg solid waste disposal site in Haldimand Township. It is also reported that the berm constructed at the solid waste disposal site at Baltimore is protecting the stream water quality from direct runoff from the disposal site.

III POLLUTION SURVEY

A. General

Samples were collected from the three watercourses which provide surface drainage for the Town of Cobourg and also from the outfalls to these watercourses. The sampling program included adjacent areas of the Township of Hamilton as well as the Town of Cobourg. A map of each watercourse showing the sampling locations has been included along with pertinent comments on each watercourse. The field sampling program was carried out in June, August and October, 1971. The Ontario Water Resources Commission laboratory in Toronto performed all bacteriological examinations and sanitary chemical analyses on the samples collected. The results of the tests are recorded in Tables IX, X, XI and XII in Appendix B to this report. A summary of the sample results from the 1959 and 1961 survey has also been included for comparison purposes. These results are contained in Tables XIII, XIV, XV and XVI in Appendix B. An interpretation of the laboratory results is given in Appendix C.

Our objectives for surface waters are described in the booklet entitled "Guidelines and Criteria for Water Quality Management in Ontario". A copy of the booklet is enclosed in the pocket on the back cover of this report. The publication contains the guidelines and introduces water quality criteria for various uses including public, agricultural, and industrial water supply, recreation, aesthetic enjoyment and the propagation of fish and wildlife. The guidelines should be followed to determine the acceptability of a watercourse for various uses.

B. "Town Watercourse"

In the 1959 report released by the Ontario Water Resources Commission the following problems were noted.

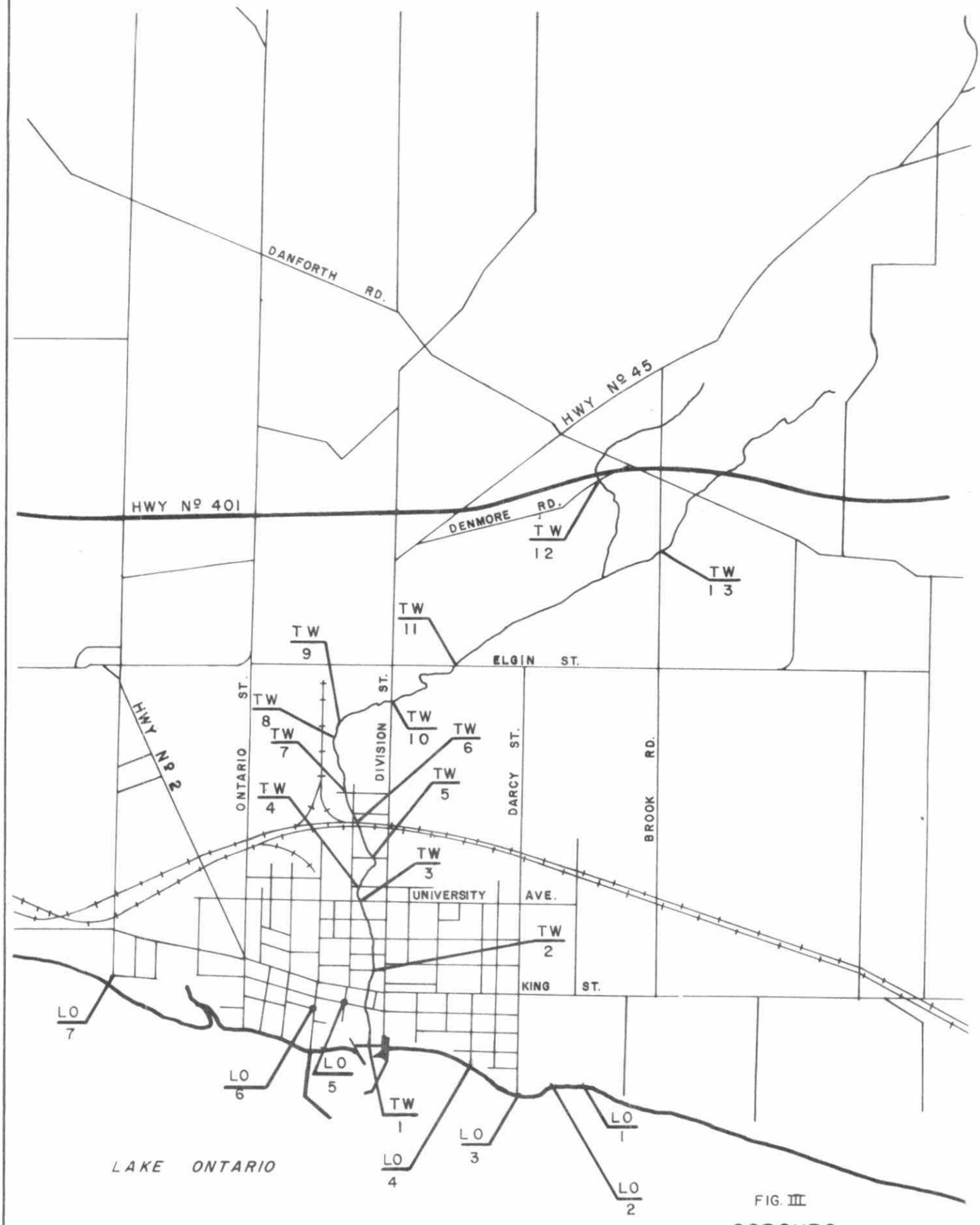


FIG. III

COBOURG TOWN WATERCOURSE AND LAKE ONTARIO

SAMPLING LOCATIONS

- The cooling water effluent at Canadian General Electric Limited had a high bacterial count (100,000 total coliform bacteria per 100 ml). It was understood that this company was adequately served by the municipal sanitary sewer system.

- A manhole on King Street was examined near the municipal storm drain outfall and evidence of sanitary industrial waste was found.

- A sample was collected from the manhole on the storm sewer at the corner of University Avenue and George Street. This municipal storm sewer outfall is located on the west bank of the "Town Watercourse" in the enclosed section at University Avenue. Sample results indicated evidence of industrial waste.

The 1961 report reviewed the problems encountered in 1959. The results indicated that there was a problem at Canadian General Electric Limited and the storm sewer at King Street still contained sanitary wastes. The sample results from the 1959 and 1961 reports have been enclosed in Appendix B in Table XIII.

The 1971 sample results continued to show evidence of problems in the "Town Watercourse". Based on the limited number of samples collected during this recent survey the bacterial quality of the "Town Watercourse" exceeds our objectives for total body contact recreation in the areas surveyed.

There were two sampling runs along this watercourse. A summary of the sample results has been enclosed in Appendix B in Table IXa and IXb. A set of samples was collected in June and another in October. Unfortunately time did not permit the complete sampling of the watercourse over a single day during the first sampling run. A bar graph of the stream bacterial quality based on the October sampling run has been used to illustrate the variations in bacterial quality throughout the length of the creek. Bacterial results for the October sampling run shows evidence of contamination in the Town Watercourse below Division Street. The June results were much higher than the results obtained in October. The chemical analyses shows that the 5-day BOD results increased as the "Town Watercourse" approaches Lake Ontario. The June BOD results were above 4 ppm whereas during the October run, results were below this value.

On June 23 samples were collected from the upper regions of the "Town Watercourse". Both the 5-day BOD and the bacterial quality were within the expected ranges considering the type of area being drained. One exception to this was the high bacterial count in the effluent from Canadian General Electric Limited. On June 24 sampling was continued downstream with the last sampling point from the previous day being re-sampled for comparison purposes. The results of the samples collected on June 24 shows a considerable change in the water quality even in the area previously sampled. It appears that a waste was discharged to the watercourse upstream. The unsatisfactory water quality continued throughout the remainder of the watercourse with some slight improvement occurring in the centre of the town.

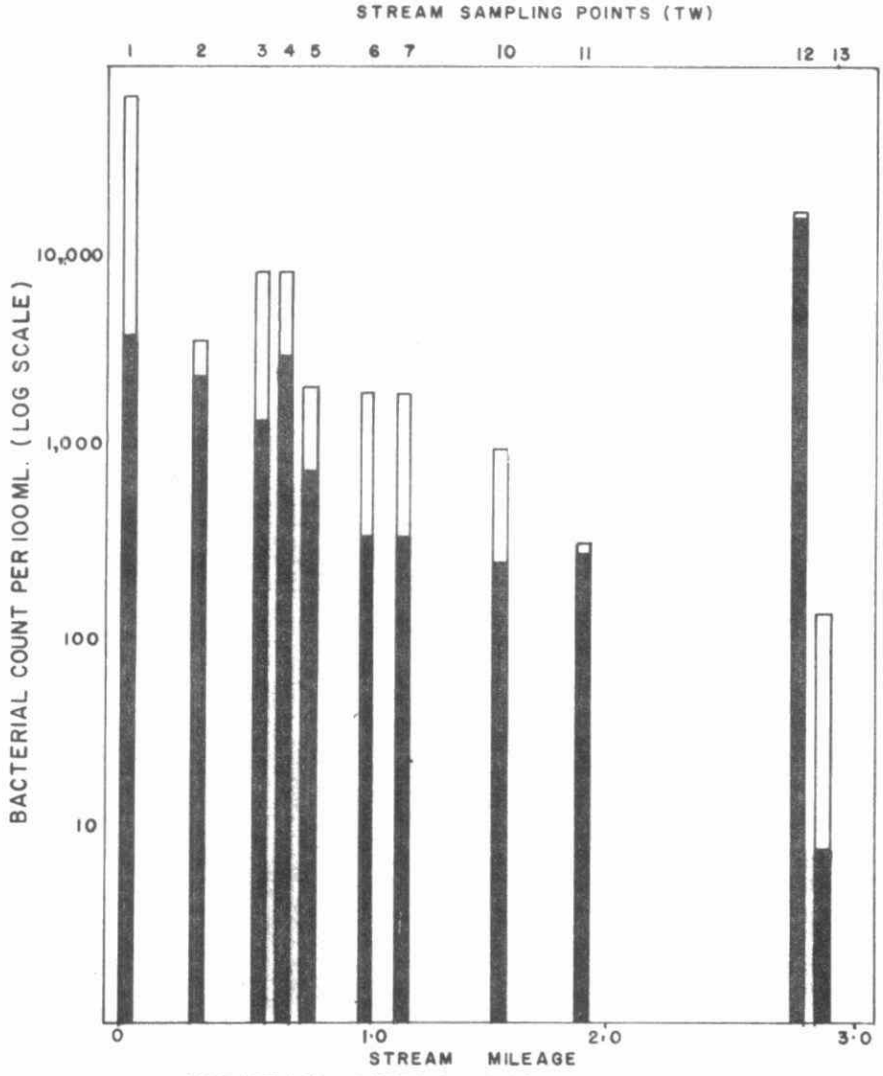
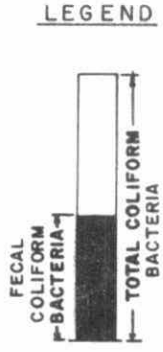


FIG. IV (A) BACTERIOLOGICAL STREAM QUALITY
TOWN WATERCOURSE



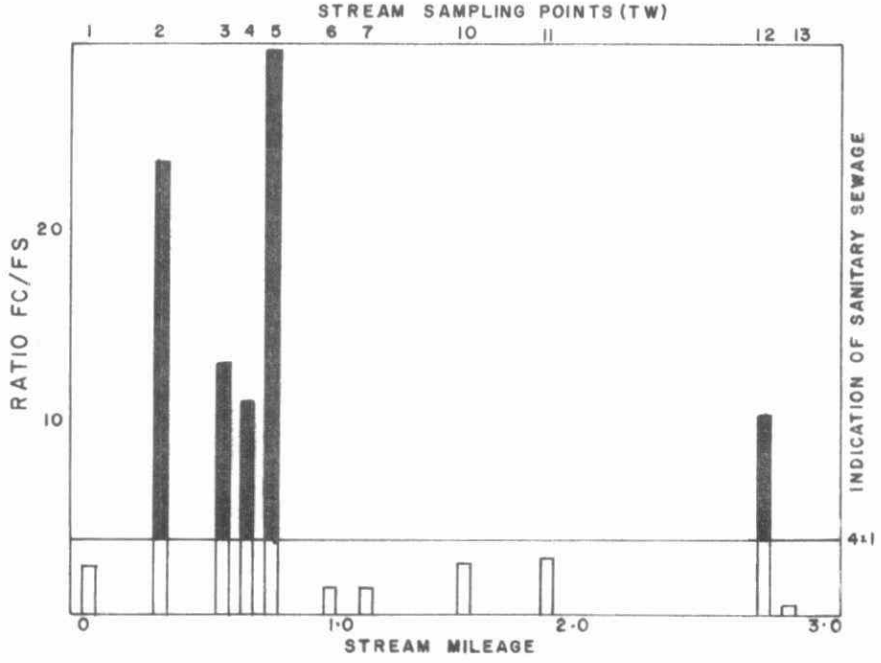


FIG. IV (B) BACTERIOLOGICAL STREAM QUALITY
TOWN WATERCOURSE

LEGEND

FC-FECAL COLIFORMS

FS-FECAL STREPTOCOCCUS ORGANISMS

On October 28 a second set of samples was collected throughout the entire length of the watercourse. The bacterial quality was generally good in the area upstream of Division Street although a very high bacterial count was obtained at Brook Road North (see Figure IV). The sample collected from the cooling water at Canadian General Electric Limited had a high bacterial count. The bacterial quality further downstream showed signs of impairment. There appears to be a problem in the area of Park Street and Spencer Street. Further investigations will be required to confirm the presence of sanitary waste and to locate its source or sources. In the area between Covert Street and Cobourg Harbour a further deterioriation in the water quality takes place. In this area, the only known outfall is the King Street storm sewer which has in the past carried sanitary waste to this creek. It appears, from the results, that sanitary wastes are still gaining access to this sewer. The chemical results throughout the creek were generally satisfactory.

The high bacterial count obtained on October 28 at Brook Road North is difficult to explain. Since there is little residential development in this area and the land around the sampling point was under cultivation. The closest residence to the sampling point is a farm house on Denmore Road just east of Brook Road North. Further sampling in this area is required to confirm these sample results.

C. Cobourg Brook

In the 1959 and 1961 OWRC reports on Cobourg Brook, the investigations extended from the mouth of the creek to its headwaters in Haldimand and Hamilton townships. In this report the investigations were concentrated in the Town of Cobourg and the adjacent areas of the Township of Hamilton.

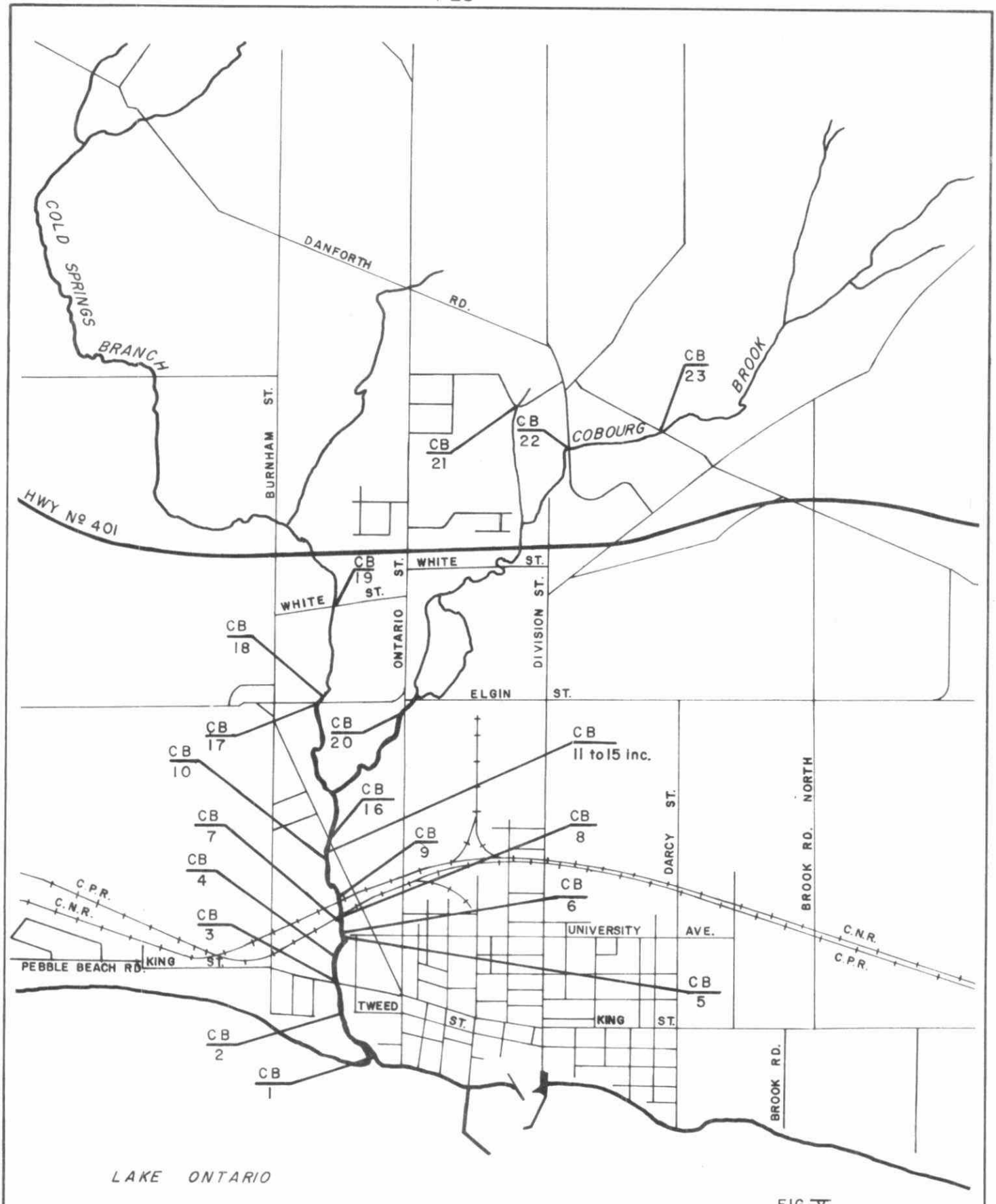


FIG. V

COBOURG
COBOURG BROOK
SAMPLING LOCATIONS

In 1959 the OWRC report noted that there was satisfactory water quality in the upper reaches of Cobourg Brook but problems were apparent in the Town of Cobourg. The 1959 report noted the following problems:

- Industrial waste flows from Stewart's Dairy to the creek were unsatisfactory for discharge to a watercourse. Waste treatment facilities were required at this plant.

- A private drain to the west side of the Cold Springs branch of Cobourg Brook near Elgin Street contained sanitary wastes.

- Contaminating wastes were present in the flows from General Foods Limited.

- Evidence of sanitary wastes was detected in the cooling water effluent being discharged to the creek from General Wire & Cable Limited.

- The overflow from the municipal trunk sanitary sewer on the east bank of Cobourg Brook at University Avenue was discharging raw sewage.

- A private drain on the east bank of Cobourg Brook opposite the sewage treatment plant had sanitary wastes in its effluent.

- The effluent from the sewage treatment plant was very unsatisfactory.

- A municipal storm drain outfall opposite Queen Street had sanitary wastes in its effluent.

In the 1961 report of the water quality of Cobourg Brook, problems were noted at all locations mentioned in the 1959 report except at the storm sewer outfall at Queen Street (see Table XIV).

The 1971 surveys show that the greatest problems continued to be present around the sewage treatment facilities (see Tables XA and XB). It should however be noted that construction was well underway on the expansion and conversion of the old 1.5 MGD trilckling filter plant to a 3.53 MGD modern activated sludge plant.

The chemical water quality of Cobourg Brook in the Township of Hamilton was generally satisfactory but some high coliform counts were obtained in this area. A bacterial sample collected from the Cold Springs branch of Cobourg Brook at White Street indicated the presence of sanitary wastes in the creek but additional sampling is required to substantiate these results (see Figure VI). Similar results were obtained from Cobourg Brook at Oliver's Lane and at Division Street north of Highway 401. The waste disposal problem at Stewart's Dairy no longer exists. The dairy ceased operation in 1968. Evidence, both visual and analytical, indicated that sanitary wastes were being discharged in a cooling water effluent from General Wire & Cable Limited. Apparently, the plumbing in a washroom had been connected to an effluent pipe which discharges to Cobourg Brook. The local Health Unit has investigated this problem and has ordered the industry to make necessary alterations in their plumbing system. Canadian General Foods Limited discharges its cooling water to an outfall pipe behind the Supertest Service Station on the west side of William Street. The sample results show that the effluent quality was satisfactory for discharge to surface waters.

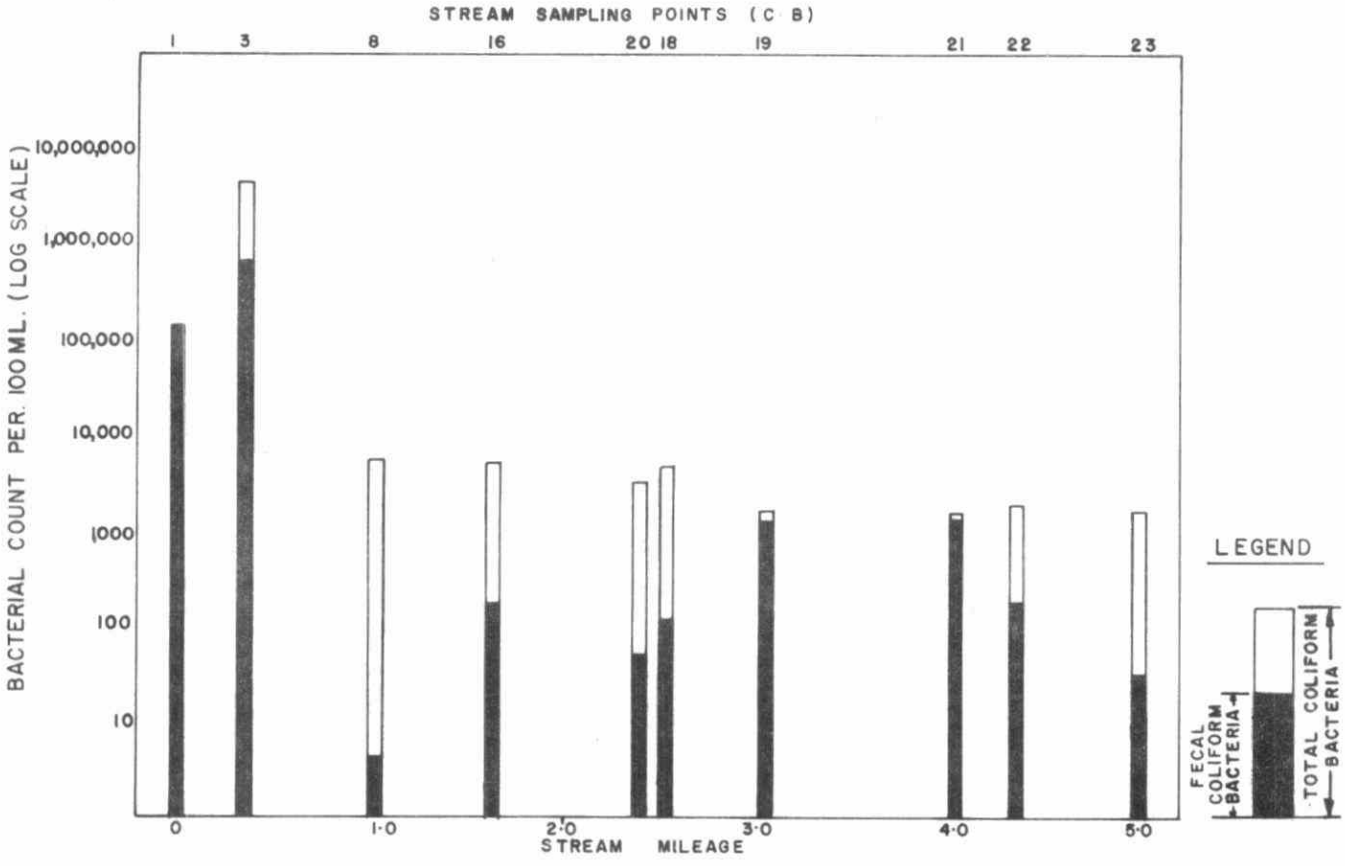


FIG. VI (A) BACTERIOLOGICAL STREAM QUALITY
COBOURG BROOK

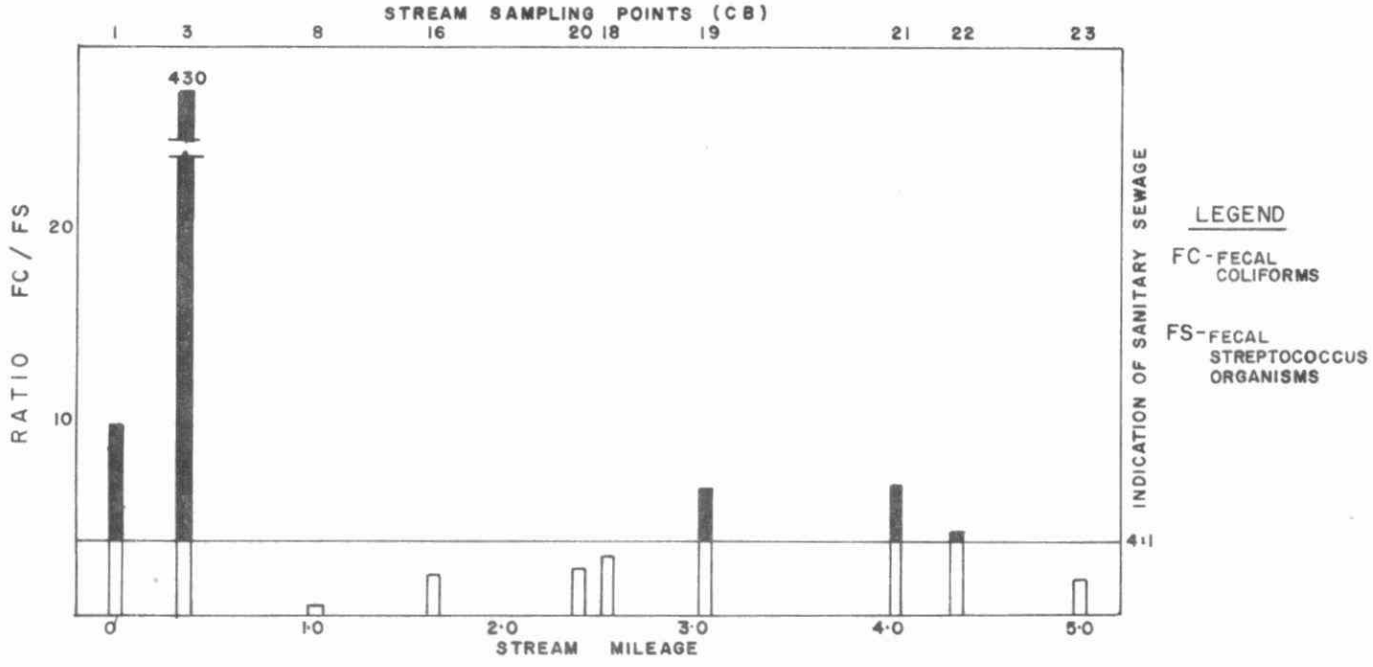


FIG. VI B BACTERIOLOGICAL STREAM QUALITY
COBOURG BROOK

Since major modifications were being made to the Cobourg sewage treatment facilities in 1971 and in the spring of 1972, a set of samples was collected in June 1972 to determine what improvement has taken place in the stream water quality. The bacterial sample results show considerable improvement in the stream water quality. The chemical quality was generally satisfactory.

At the present time we are investigating a foaming problem at the sewage plant to determine its cause and to recommend remedial action. Evidence of the foaming problem can be seen in Cobourg Brook below the outfall.

D. Brook Creek

In the 1959 report, problems were noted at the following locations:

- The Sidbrook Private Hospital is located on the west side of Brook Creek. Wastes from the septic tank system at the hospital were surfacing near Brook Creek and gaining access to the creek.

- The effluent from a municipal storm drain on the west bank of Highway 2 had a high BOD.

The report also noted that the local Health Unit had placarded the mouth of the creek and the area of the CNR Right-of-Way to protect swimmers because of a potential health hazard.

The sample results from the 1961 survey indicated generally satisfactory conditions (see Table XV). The problem at the Sidbrook Private Hospital had been corrected by connecting the hospital's waste disposal system to the Town of Cobourg municipal collection system. The sample results from the municipal storm sewers at Highway No. 2 were satisfactory.

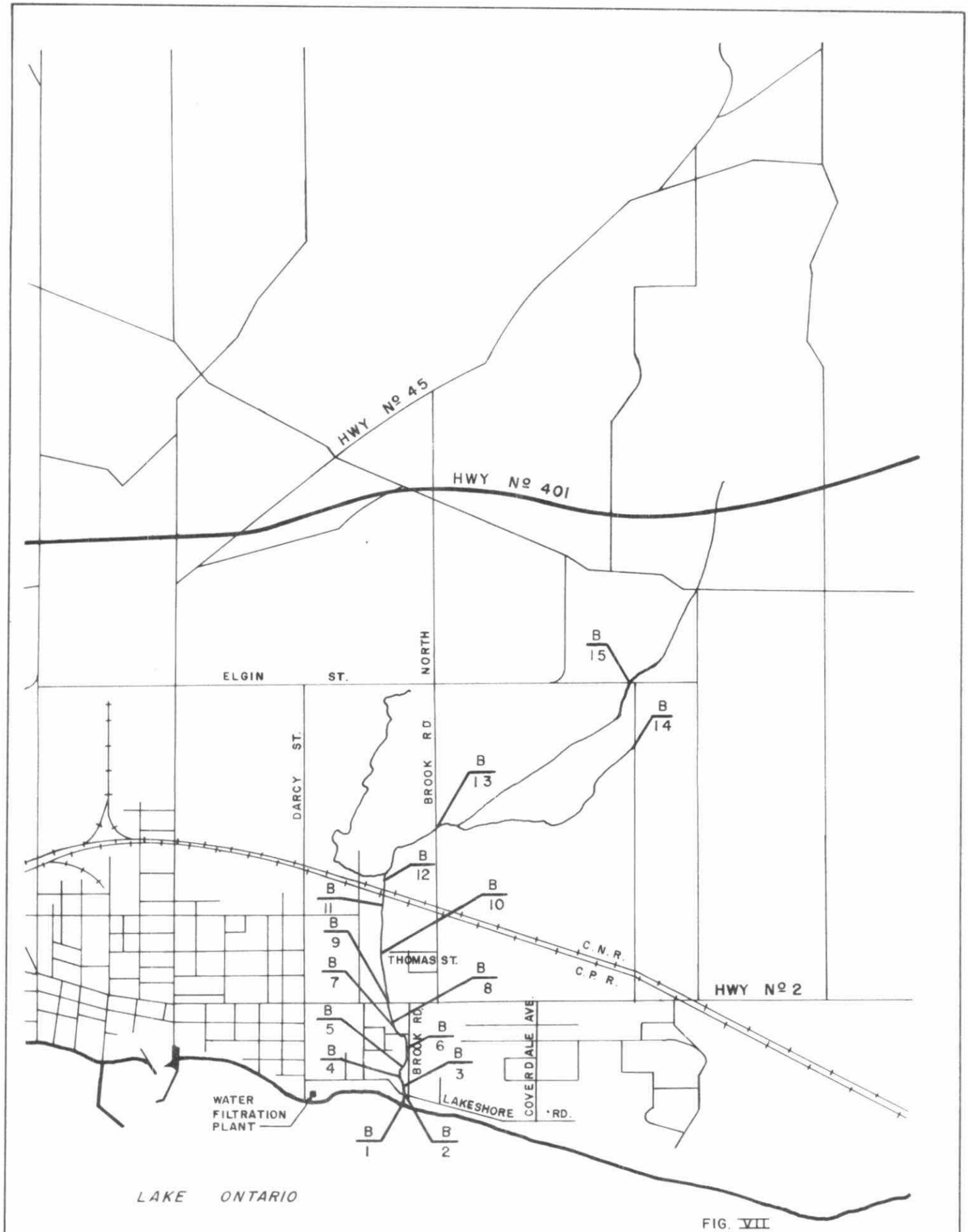


FIG. VII

COBOURG
BROOK CREEK
SAMPLING LOCATIONS

Information obtained during the 1971 field investigations indicate that Brook Creek receives sanitary wastes either directly from outfalls or indirectly through seepage from private sub-surface disposal systems. Based on the limited number of samples collected during the survey the results tend to indicate that the bacterial quality exceeded our guidelines for water used for total body contact recreation (see Table XIB).

Samples were collected on June 15, in the area south of Highway No. 2 and on June 23 in the area north of Highway No. 2. A second complete set of samples was collected on October 28 throughout the length of the creek. A bar graph of the stream bacterial quality on October 28 shows that the water quality in the creek deteriorated as it flowed towards Lake Ontario.

The samples collected during 1971 indicated that there is one or more problems in the area between Acadia Drive and Lakeshore Road (see Figure VIII). Only one problem has been located to date and it is reported that corrections have been made. Other problems exist in the area; they may not be due to direct discharges but rather from septic tank tile bed seepage. At the present time the only means of sanitary waste disposal in this area is by sub-surface disposal. This area has a high water table and this would interfere with the proper operation of this type of disposal system. Near Lakeshore Road a culvert and drainage course joins Brook Creek. Samples from these sources indicate that sanitary waste are present and that problems with the septic tank systems are not confined just to the area along Brook Creek. There was no flow from the storm sewer at Highway 2 during the times when field investigations were being carried out.

The storm sewer outfall just north of the CNR lines drains the area along

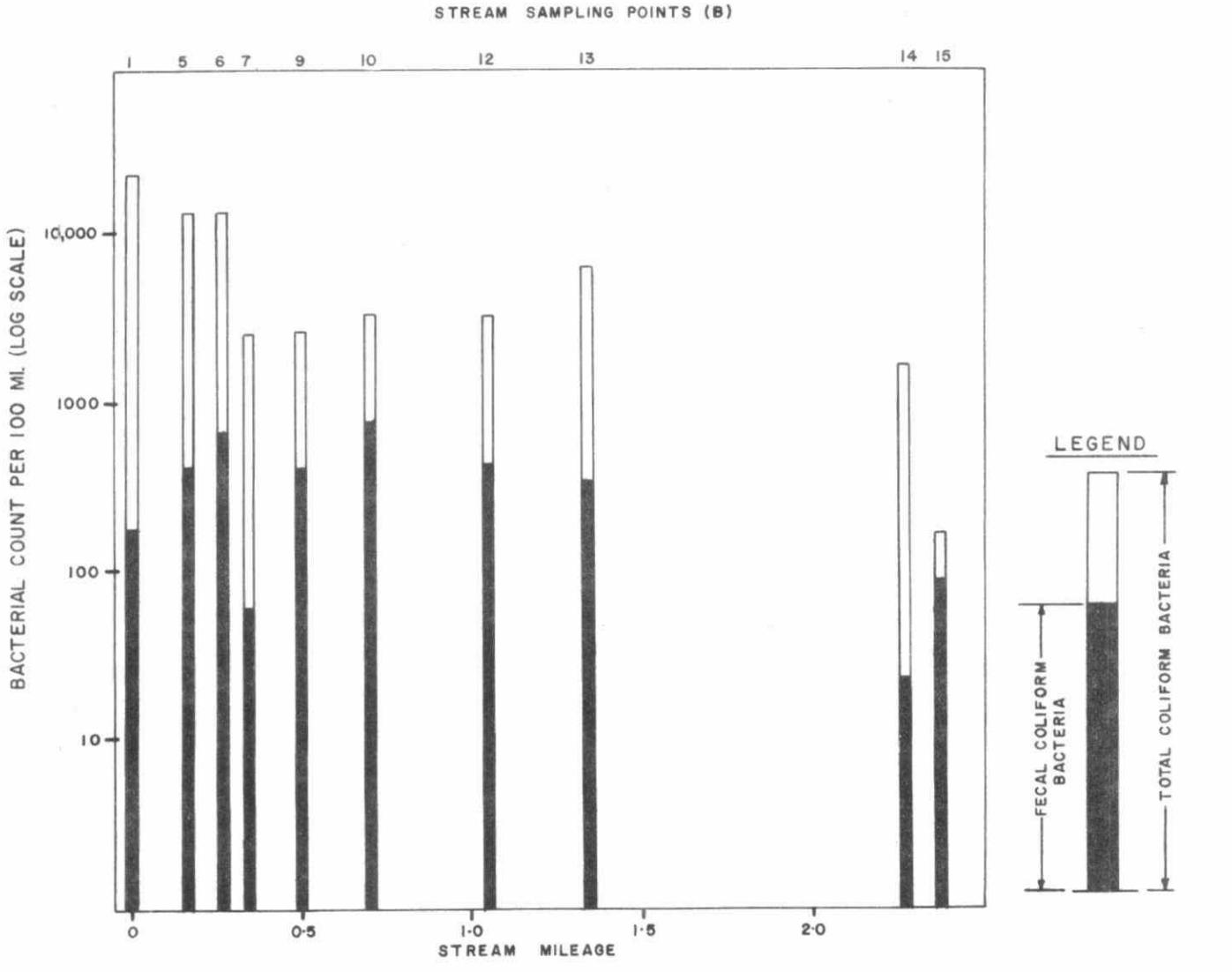


FIG. VIII (A) BACTERIOLOGIAL STREAM QUALITY
BROOK CREEK

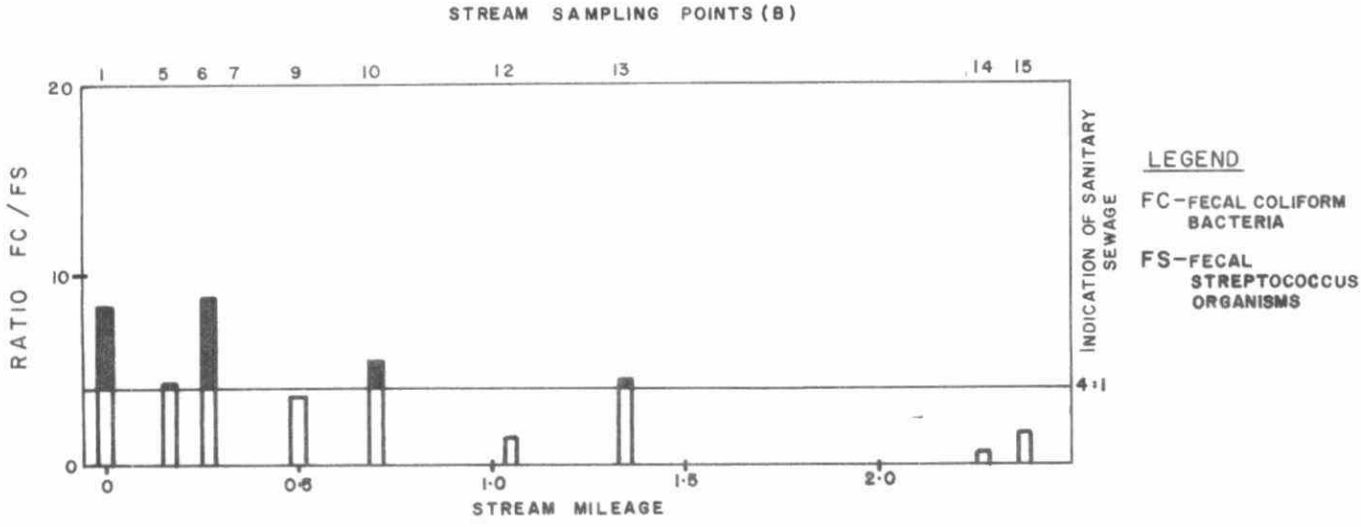


FIG. VIII (B) BACTERIOLOGICAL STREAM QUALITY
BROOK CREEK

Darcy Road and the Central Ordinance Depot. The bacterial counts in the effluent were not unusually high but the ratio of faecal coliforms to faecal streptococcus organisms suggests that sanitary wastes are gaining access to the storm sewer.

E. Lake Ontario

In the 1959 report, mention was made of a number of outfalls discharging to Lake Ontario. Most of the problems found centred around Cobourg Harbour where overflows from the sanitary sewage collection system gained access to the storm sewer system. The arrangements which permitted overflows from the sanitary sewer system to the storm sewer system were originally intended to permit a discharge only during emergencies. When the overflow arrangements were examined it was found that weirs separating the storm sewers and sanitary sewers had been completely removed, this allowed raw sewage to discharge to the storm sewers continuously.

The 1961 review of the initial survey in Cobourg noted that the weirs had been replaced but sanitary sewage was escaping around the ends of the weirs located at Albert Street and Third Street, and at Albert Street and Division Street.

On August 11, 1971, the overflow arrangements were checked at Albert Street and Division Street and at the Victoria Plaza pumping station. The overflow arrangement at Albert Street and Third Street was allowing raw sewage to gain access to the storm sewer and into Cobourg Harbour because the weir was not water-tight. The sample results confirmed the unsatisfactory quality of the storm sewer effluent. At the manhole at Albert and Division streets,

there was no problem. The overflow arrangement at Victoria Street pumping station had been plugged.

During this survey samples were not collected from Lake Ontario. The results of the raw water sampling programme at the Cobourg Water Filtration Plant are a good indication of the lake water quality in the shallow areas (see Tables II and VII). As indicated earlier in this report, the raw water bacterial quality exceeded our desirable criteria level in 1971. These results reflect the unsatisfactory water quality from the three watercourses in this area as well as the sanitary sewage overflows to the storm sewers discharging to Cobourg Harbour.

suggestions made by this branch without detailing other specific requirements. Under the above limitations of the review, the majority of recommended changes to the programs pertaining to sampling point locations (relocation, addition and deletion of stations), to parameter choices, and to sampling frequencies are those suggested by staff from this branch and the districts mentioned above.

IV FUTURE SEWAGE WORKS REQUIREMENTS

The capacity of the Cobourg sewage treatment plant is presently being increased along with the upgrading of the treatment facilities. A great improvement in effluent quality is expected but this in itself may not be sufficient to reduce the loading on Cobourg Brook sufficiently to allow enough improvement in the stream water quality to meet our water quality objectives. In addition, treatment facilities for improved phosphorus removal will be required by December 31, 1975 in accordance with the previously ammounced phosphorus removal programme. Some problems in the collection system have been outstanding for many years. The weir arrangements separating the storm sewer system and the sanitary sewer system have not always been satisfactory. Poor fitting weirs have been responsible for unnecessary discharges of raw sewage to the storm sewers. In the developing areas adjacent to the Town of Cobourg, the need for sanitary services is increasing. Problems are already apparent on the east side of Cobourg and a municipal sewage collection system is needed. A provincial sewage works program is being considered in this regard.

Sewage Treatment Plant Outfall

Arrangements are being made to change the treatment process and to increase the capacity of the sewage plant. To protect the water quality in Cobourg Brook below the sewage plant, it may be necessary to extend the sewage treatment plant outfall to Lake Ontario. The expanded sewage treatment facilities has been designed to treat up to 3.53 MGD of waste. During dry weather flows in the creek there will be less than a 2 to 1 dilution ratio (see Table I). Our Water Quality Branch has made a preliminary study of the effect the new sewage treatment plant will have on the creek, based on the expected plant effluent quality. The preliminary study indicates

These are my comments made verbally early in '72 to D.E. P. Baker

that the effluent may have a detrimental effect on Cobourg Brook. It is expected that low dissolved oxygen levels will continue to occur in the creek below the sewage plant. Under these conditions the outfall from the sewage treatment plant will need to be extended out into Lake Ontario to protect the water quality of Cobourg Brook. When the new sewage works is completed and fully operational, a study will be made to determine the actual conditions in Cobourg Brook below the sewage treatment plant and determine whether the outfall actually needs to be extended into Lake Ontario.

Phosphorus Removal

In April 1971, the Province of Ontario, through the Ontario Water Resources Commission set forth a program for the installation of phosphorus removal facilities at various sewage treatment plants in the Province. The sewage treatment plant at Cobourg should have phosphorus removal facilities installed and operating by the end of 1975. The phosphorus removal program will require that the designated plants be able to remove at least 80 per cent of the phosphorus loading on the sewage treatment plant. Each treatment plant will require a separate pilot study to determine which of the various chemicals and treatment methods available suits their operation. As a result of an agreement between the Federal and Provincial Governments assistance has been made available to meet the cost of treatability studies. It is expected that with nutrient removal facilities installed, the quality of the effluent will be further improved.

Sewage Collection System - Internal Problems

The sewage collection system serving the area east of Cobourg Brook was originally installed more than 50 years ago. At that time raw sewage was discharged to the harbour. When the system was originally installed many

storm and roof drains were connected to the system. When the system was connected to the sewage treatment plant, hydraulic overloading of the system caused flooding in some areas. A system of weirs with overflow arrangements to the storm sewer system was incorporated into the collection system. As mentioned earlier in this report past field investigations in Cobourg found that the weirs were not fitted properly and untreated sewage was escaping unnecessarily to the storm sewer system. On August 11, 1971, the weir in the manhole at Albert Street and Division Street was not providing proper separation in the storm and sanitary sewers. Some work has been carried out to remedy the problems of infiltration but some problems remain. During field investigations in June, 1971, staff found a problem at Spencer Street on the east side of the "Town Watercourse" whereby water from the creek was able to flow into the sanitary sewer because an overflow arrangement was situated such that the creek bed was higher than the overflow. During the subsequent sampling run on October 28, it was noted that a piece of plywood had been placed over the sewer to try and prevent stream water from entering the sewer. A more effective means should be used to control this problem.

The municipal officials should continue to completely separate the storm water flows from the sanitary flows. At all points of sanitary sewage discharge to a storm sewer or drainage course, an alarm system should be installed and records maintained of the frequency of the overflows to determine whether the overflows is due to storm water infiltration or excessive waste loadings. It is pointed out that it is now a requirement under the Water Resources Act that all instances of raw sewage bypassing to a watercourse be reported to this Ministry.

Sewage Disposal in Hamilton Township

In the Township of Hamilton on the east side of Cobourg, in the most heavily developed area, problems with the operation of some of the sewage disposal systems has occurred. The results of samples from Brook Creek indicate the presence of sanitary waste in the watercourse. A high water table in some areas and poor soil conditions in other areas (see Figure I) is responsible for many of the problems. It is not uncommon in this area for laundry wastes to be directed to sumps and then pumped to the roadside ditches in order to prevent overloading of the septic tank systems. Problems will continue to develop in this area unless sanitary services are provided.

Development on the west side of Cobourg is relatively new, most of the homes are less than five years old. There were no apparent problems with the septic tank system in this area during this survey. The soil appeared to be sandy. One resident of the area reports that the ground "just eats up water". In Figure I there is no indication of the boundaries between the sand areas and the silt and clay areas on the lake plain. Recent soil borings in this area indicates that there is 6.5 feet of silty sand over clay and silt. However, over a period of time the ground will likely become saturated with the wastes and problems could develop.

It appears logical that sewage collection services from the Town of Cobourg should be extended to serve the adjacent areas of the Township of Hamilton where there currently is a waste disposal problem and to areas where the residential density indicates the need for such a service.

V SUMMARY AND CONCLUSIONS

This report reviews the water supply, waste disposal and water pollution in the Town of Cobourg and in the adjacent areas of the Township of Hamilton. The field investigations were carried out in 1971 and the preparation of the report was completed in 1972.

The results of the survey indicate that there are a number of problems which need correction. Unsatisfactory effluent discharges were noted at two industries in the Town of Cobourg. Corrections have been initiated at General Wire and Cable Limited. Investigations should be made by Canadian General Electric to determine the cause of the high bacterial counts in their cooling water effluent. There are a number of problems in the Town of Cobourg sewage collection system which allow sanitary sewage to overflow to the storm sewer system and allow surface water to gain access to the sanitary sewer system. Elimination of storm water from the town's sanitary sewage collection system is most desirable to prevent overloading of the collection system and the resulting raw sewage discharges to the storm sewer system.

Samples collected from Cobourg Brook shows the tremendously adverse affect the sewage treatment plant was having on the watercourse. A great improvement in the stream water quality is expected with the completion of the new sewage treatment facilities.

The water quality of the "Town Watercourse" appeared to be adversely affected by discharges from storm sewers and private wastewater discharges. Investigation of the storm sewer system and the elimination of waste discharges to the storm sewers is required to improve the quality of the "Town Watercourse". The elimination of high bacterial counts in the Canadian General Electric cooling

water effluent will improve the stream bacterial quality.

Near its mouth the Brook Creek watercourse passes through a developed area, in the Township of Hamilton, which utilizes individual sub-surface disposal systems to dispose of sanitary wastes. Problems have been encountered with many of the systems because of the high water table. Drainage from some of these systems appears to be responsible for the deterioration in the stream quality. Improvement in the water quality will likely only occur when sanitary sewers are provided in this area.

The effect of the water quality from the three watercourse, Cobourg Brook, "Town Watercourse" and Brook Creek have an unsatisfactory effect on the raw water quality at the Cobourg water filtration plant. Some improvement is expected in the water quality when the town's new water works intake and expanded sewage treatment plant are completed. Correction of the problems noted in the report will also do much to improve the raw water quality at the water works.

VI RECOMMENDATIONS

Water Works

1A. The problem of sand reported in the Baltimore Heights communal water works in the Township of Hamilton should be resolved.

Sewage Works

1B. All points in the sewage collection system which have overflow arrangements should be equipped with monitoring devices to record the frequency of overflows and all overflow occurrences should be reported to this Ministry.

2B. The overflow weir at Albert Street and Division Street should be repaired to prevent raw sewage from flowing under the weir.

3B. A more permanent arrangement should be made at Spencer Street to prevent drainage from the "Town Watercourse" gaining access to the sanitary sewer system.

4B. A study to determine the best phosphorus removal treatment method for the Cobourg sewage treatment plant should be started after the expanded plant resumes normal operation.

5B. The sewage collection system should be extended to serve adjacent developed areas of the Township of Hamilton, particularly the developed area on the east side where active pollution problems were noted.

Pollution Investigations

1C. The Municipal Officials should institute a program to investigate and correct problems of storm water entering its sanitary sewers and of contaminated waste flows entering its storm drainage works.

2C. The officials of Canadian General Electric should monitor their effluent and their waste collection system to determine the source of the bacterial contamination.

Prepared by: .....

J. A. Clarke, Technologist
District Engineers Section
Sanitary Engineering Branch

/cs

APPENDIX A

WATER SUPPLY

WATER QUALITY SUMMARY

Tables V - VIII

TABLE V

RAW WATER QUALITY

TOWN OF COBOURG - MUNICIPAL WATER WORKS
CHEMICAL ANALYSES - 1971

DATE (d/m)	HARDNESS $CaCO_3$	ALKALINITY $CaCO_3$	IRON Fe	CHLORIDE Cl	pH at Lab	APPARENT COLOUR	TURBIDITY UNITS
27/1	142	100	1.30	30	8.0	L 5	25
22/2	144	100	0.20	31	8.1	L 5	4
23/3	138	98	0.05	29	8.4	L 5	6
20/4	142	103	0.10	29	8.4	L 5	1
17/5	140	100	L 0.08	36	8.6	10	2
14/6	138	101	0.05	29	8.4	5	2
12/7	140	98	0.05	29	8.1	L 5	3
9/8	140	100	0.15	28	8.0	5	3
28/9	134	93	0.05	29	8.1	5	2
30/11	136	98	0.10	29	8.2	-	3
AVERAGE	139	99	0.21	30	8.2		5
MAXIMUM	144	103	1.30	36	8.6	10	25
MINIMUM	134	93	0.05	28	8.0	L 5	1

TABLE VI

RAW WATER QUALITY

TOWN OF COBOURG - MUNICIPAL WATER WORKS
SUMMARY CHEMICAL ANALYSES - 1968 - 1970

	HARDNESS $CaCO_3$	ALKALINITY $CaCO_3$	IRON Fe	CHLORIDE Cl	pH at Lab	APPARENT COLOUR	TURBIDITY UNITS
1970							
AVERAGE	138	96	0.18	29	8.3	-	6
MAXIMUM	148	100	0.40	31	8.5	10	8
MINIMUM	126	89	0.05	28	8.1	L 5	2
1969							
AVERAGE	141	101	0.24	28	8.1	-	6.2
MAXIMUM	154	105	0.60	29	8.6	20	20
MINIMUM	136	93	0.05	27	6.9	L 5	2
1968							
AVERAGE	140	97	0.58	28	8.2	-	6.9
MAXIMUM	154	104	1.75	30	8.5	20	14.0
MINIMUM	132	87	0.22	25	7.8	5	2.1

L = less than

TABLE VII

RAW WATER QUALITY

TOWN OF COBOURG - MUNICIPAL WATER WORKS

BACTERIOLOGICAL RESULTS -1971

DATE (d/m)	BACKGROUND COLONIES	COLIFORM BACTERIA	DATE (d/m)	BACKGROUND COLONIES	COLIFORM BACTERIA
2/2	8,100	206	3/8	60,000	258
15/2	14,600	1,700	9/8	47,200	2,600
22/2	12,700	2,500	9/8	60,000	1,100
			23/8	70,000	2,500
1/3	6,600	2,100	30/8	34,000	1,800
8/3	21,500	4,500			
15/3	18	14	7/9	24,200	720
22/3	2,000	600	14/9	360,000	1,600
23/3	54	24	20/9	60,000	18
29/3	46	44	20/9	190,000	110
			27/9	202,000	11,300
5/4	2,800	600	27/9	78,000	5,500
12/4	6,500	356	28/9	82,000	314
19/4	3,600	220			
26/4	3,600	3,500	4/10	22,600	0
			12/10	118,000	12,300
3/5	9,100	900	18/10	1,500	26
10/5	3,200	58	25/10	8,800	1,700
17/5	2,200	68			
25/5	254	4	1/11	42,000	1,200
31/5	920	74	8/11	2,600	36
			22 /11	40,000	6,100
7/6	110,000	800	30/11	600	48
14/6	3,000	42			
21/6	1,300	30	6/12	1,900	228
28/6	10,500	134	6/12	1,500	112
			13/12	16,600	444
5/7	39,000	1,700	13/12	18,200	1,000
12/7	1,900	40			
12/7	1,000	82			
19/7	11,500	424			
26/7	17,600	484			

TABLE VIII

TREATED WATER QUALITY

TOWN OF COBOURG - MUNICIPAL WATER WORKS
BACTERIOLOGICAL RESULTS - 1971

HEALTH UNIT SAMPLING PROGRAMME

MONTH	NO. SAMPLES	NO. SATISFACTORY	NO. DOUBTFUL	NO. UNSATISFACTORY
January	2	2	-	-
February	12	12	-	-
March	19	18	1	-
April	4	4	-	-
May	10	10	-	-
June	7	7	-	-
July	5	5	-	-
August	1	1	-	-
September	3	3	-	-
October	8	8	-	-
November	7	7	-	-
December	3	3	-	-
TOTAL	81	80	1	0

PUC SAMPLING PROGRAMME

January	1	1	-	-
February	4	4	-	-
March	5	5	-	-
April	5	5	-	-
May	5	5	-	-
June	4	4	-	-
July	4	4	-	-
August	5	5	-	-
September	6	6	-	-
October	4	4	-	-
November	3	3	-	-
December	4	4	-	-
TOTAL	50	50	0	0

APPENDIX B

POLLUTION SURVEY - SAMPLE RESULTS 1971

Tables IX - XII

SAMPLE RESULTS - 1959 - 1961

Tables XIII - XVI

All results reported in ppm.

Samples collected by:
J.A. Clarke
A.F. Leitch
A.D. McConnell

TABLE IXA - TOWN WATERCOURSE

TOWN OF COBOURG

CHEMICAL ANALYSIS

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	5-DAY BOD	SUSPENDED SOLIDS	CHLORIDE as Cl	NITRATE as N
TW-1	Town watercourse just above Cobourg Harbour	August 11	2.5	10	29	0.56
		October 28	2.0	5	50	0.51
TW-2	Town watercourse at Covert Street	June 24	4.5	5	68	0.78
		August 11	0.8	10	24	0.66
		October 28	1.0	5	50	0.35
TW-3	Town watercourse at University Avenue East	June 24	5.0	5	92	0.80
		October 28	1.2	5	49	0.33
TW-4	Town watercourse at Spencer Street West	June 24	5.0	10	86	0.85
		October 28	1.2	5	49	0.33
TW-5	Town watercourse at Park Street	June 24	5.5	4	96	0.89
		October 28	1.0	5	49	0.35
TW-6	Town watercourse at Station Street	June 24	5.0	5	100	0.90
		October 28	1.0	5	48	0.35
TW-7	Town Watercourse at Cobourg Street	June 23	0.8	5	25	0.36
		June 24	4.5	5	96	1.0
		October 28	1.0	5	48	0.35
TW-8	Outfall to Town watercourse behind Canadian General Electric	June 23	1.6	5	35	0.19
		October 28	5.0	5	39	0.87

TABLE IXA - cont'd

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	5-DAY BOD	SUSPENDED SOLIDS	CHLORIDE as Cl	NITRATE as N
TW-9	Outfall from north side Canadian General Electric	October 28	0.8	40	-	0.05
TW-10	Town watercourse at Division Street	June 23	0.4	5	23	0.38
		October 28	0.8	5	49	0.39
TW-11	Town watercourse at Elgin Street East	June 23	0.8	5	21	0.42
		October 28	0.8	5	44	0.45
TW-12	Town watercourse at Denmore Road	June 23	0.4	5	21	0.51
		October 28	0.6	5	37	0.63
TW-13	Town watercourse at Brook Road North	June 23	N O F L O W			
		October 28	2.5	5	261	0.60

All results reported per 100 ml of sample.

Samples collected by:
J.A. Clarke
A.F. Leitch
A.D. McConnell

TABLE IXB - TOWN WATERCOURSE

TOWN OF COBOURG

BACTERIOLOGICAL REPORT

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	TOTAL COLIFORM per 100 ml	FAECAL COLIFORM per 100 ml	FAECAL STREPTOCOCCUS per 100 ml
TW-1	Town watercourse just above Cobourg Harbour	August 11	230,000	7,700	6,900
		October 28	74,000	4,000	1,460
TW-2	Town watercourse at Covert Street	June 24	128,000	7,100	G 600
		August 11	101,000	7,300	800
		October 28	3,900	2,500	104
TW-3	Town watercourse at University Avenue East	June 24	160,000	14,800	G 600
		October 28	8,900	1,500	112
TW-4	Town watercourse at Spencer Street West	June 24	300,000	8,900	G 600
		October 28	8,800	3,200	280
TW-5	Town watercourse at Park Street	June 24	240,000	16,100	G 600
		October 28	2,300	800	1
TW-6	Town watercourse at Station Street	June 24	37,000	10,700	G 600
		October 28	2,100	372	236
TW-7	Town watercourse at Cobourg Street	June 23	9,800	510	456
		June 24	39,000	10,400	G 600
		October 28	2,100	372	236
TW-8	Outfall to Town watercourse behind Canadian General Electric	June 23	38,000	1,200	352
		October 28	7,900	7,900	84

TABLE IXB - cont'd

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	TOTAL COLIFORM per 100 ml	FAECAL COLIFORM per 100 ml	FAECAL STREPTOCOCCUS per 100 ml
TW-9	Outfall from north side Canadian General Electric	October 28	72	4	36
TW-10	Town watercourse at Division Street	June 23	2,500	252	368
		October 28	1,100	260	88
TW-11	Town watercourse at Elgin Street West	June 23	2,500	392	284
		October 28	316	340	108
TW-12	Town watercourse at Denmore Road	June 23	1,700	68	108
		October 28	148	8	20
TW-13	Town watercourse at Brook Road North	June 23	N O F L O W		
		October 28	18,000	17,000	1,580

G = greater than

All analyses reported in ppm.

Samples collected by:
J.A. Clarke
A.F. Leitch
A.D. McConnell

TABLE XA - COBOURG BROOK

TOWN OF COBOURG - TOWNSHIP OF HAMILTON

CHEMICAL ANALYSES

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	5-DAY BOD	SUSPENDED SOLIDS	CHLORIDE as Cl	NITRATE as N
CB-1	Mouth of Cobourg Brook	August 9	24.0	30	70	L 0.01
		October 28	50.0	60	64	0.09
CB-2	Storm sewer outfall draining Tweed Street	August 9	N O	F L O W		
		October 28	N O	F L O W		
CB-3	Cobourg Brook at King Street West	August 9	55.0	50	106	L 0.01
		October 28	80.0	200	120	L 0.01
CB-4	Outfall from sewage treatment plant	August 9	340.0	190	464	L 0.01
		October 28	320.0	120	479	L 0.01
CB-5	Sanitary sewer - overflow weir at end of University Avenue West	August 9	280.0	340	308	L 0.01
		October 28	N O	F L O W		
CB-6	Storm sewer at end of University Avenue West	August 9	0.8	5	48	0.10
		October 28	1.4	10	46	0.85
CB-7	Overflow at sewage treatment plant	August 9	260.0	90	62	L 0.01
		October 28	950.0	340	539	L 0.01
CB-8	Cobourg Brook at Canadian Pacific Railway	August 9	1.4	52	9	0.02
		October 28	0.8	5	37	0.55

TABLE XA - cont'd

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	5-DAY BOD	SUSPENDED SOLIDS	CHLORIDE as Cl	NITRATE as N
CB-9	Overflow from pumping station	August 9	2.0	10	44	0.29
		October 28	1.2	5	71	0.92
CB-10	Outfall behind Supertest Service Station	August 9	75.0	60	43	L 0.01
		October 28	5.5	5	53	L 0.01
CB-11	Storm sewer outfall draining Harden Street	August 9	0.6	5	40	0.25
		October 28	2.5	5	46	0.35
CB-12	Outfall from General Wire & Cable	August 9	0.6	5	35	0.20
		October 28	1.0	5	32	0.04
CB-13	Outfall from General Wire & Cable	August 9	1.0	5	33	0.18
		October 28	1.0	5	33	0.07
CB-14	Outfall from General Wire & Cable	August 9	4.0	5	38	0.27
		October 28	1.6	5	32	0.10
CB-15	Outfall from General Wire & Cable	August 9	0.6	10	32	0.20
		October 28	1.0	5	32	0.04
CB-16	Cobourg Brook at Highway 2	August 9	1.4	5	7	0.02
		October 28	0.8	5	13	0.15
CB-17	Outfall on west side of Coldsprings Creek at Elgin Street	June 24	1.0	5	289	1.9
		August 9	N O	F L O W		
		October 28	0.6	5	356	1.7

TABLE XA - cont'd

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	5-DAY BOD	SUSPENDED SOLIDS	CHLORIDE as Cl	NITRATE as N
CB-18	Coldsprings Creek at Elgin Street	June 24	1.6	5	11	0.26
		August 9	1.4	5	9	0.02
		October 28	1.0	5	12	0.20
CB-19	Coldsprings Creek at White Street	October 28	1.0	5	10	L 0.01
CB-20	Cobourg Brook at Elgin Street	June 24	1.2	5	13	0.19
		August 9	1.4	10	6	0.04
		October 28	1.4	5	13	1.4
CB-21	Cobourg Brook tributary at Oliver's Lane	June 24	1.6	5	8	0.04
		October 28	1.0	5	10	L 0.01
CB-22	Cobourg Brook at Division Street north of Hwy. 401	June 24	1.0	10	7	0.21
		October 28	0.8	5	9	0.17
CB-23	Cobourg Brook at Danforth Road	June 24	0.8	10	6	0.18
		October 28	1.0	5	9	0.18

L = less than

All results reported per 100 ml of sample.

Samples collected by:
J.A. Clarke
A.F. Leitch
A.D. McConnell

TABLE XB - COBOURG BROOK

TOWN OF COBOURG - TOWNSHIP OF HAMILTON

BACTERIOLOGICAL REPORT

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	TOTAL COLIFORM per 100 ml	FAECAL COLIFORM per 100 ml	FAECAL STREPTOCOCCUS per 100 ml
CB-1	Mouth of Cobourg Brook	August 9	49,000,000	2,900,000	G 15,000
		October 28	G 150,000	G 150,000	G 15,000
CB-2	Storm sewer outfall draining Tweed Street	August 9	N O F L O W		
		October 28	N O F L O W		
CB-3	Cobourg Brook at King Street West	August 9	94,000,000	4,400,000	G 15,000
		October 28	4,900,000	660,000	G 1,500
CB-4	Outfall from sewage treatment plant	August 9	150,000,000	3,700,000	G 15,000
		October 28	17,000,000	1,100,000	570,000
CB-5	Sanitary sewer - overflow weir at end of University Avenue West	August 9	370,000,000	21,000,000	460,000
		October 28	N O F L O W		
CB-6	Storm sewer at end of University Avenue West	August 9	6,500	L 10	L 10
		October 28	850	L 10	30
CB-7	Overflow at sewage treatment plant	August 9	186,000,000	220,000	25,000
		October 28	277,000,000	43,000,000	2,010,000
CB-8	Cobourg Brook at Canadian Pacific Railway	August 9	4,700	200	510
		October 28	6,200	4	60

TABLE XB - cont'd

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	TOTAL COLIFORM per 100 ml	FAECAL COLIFORM per 100 ml	FAECAL STREPTOCOCCUS per 100 ml
CB-9	Overflow from pumping station	August 9	3,400	120	200
		October 28	27,000	20	200
CB-10	Outfall behind Supertest Service Station	August 9	520,000	5,000	350,000
		October 28	32,000	510	1,190
CB-11	Storm sewer outfall draining Harden Street	August 9	L 10	L 10	L 10
		October 28	3,300	1	10
CB-12	Outfall from General Wire & Cable	August 9	L 10	L 10	L 10
		October 28	1	1	-
CB-13	Outfall from General Wire & Cable	August 9	100	10	10
		October 28	3,900	1	44
CB-14	Outfall from General Wire & Cable	August 9	14,100	10,000	770
		October 28	3,000	1,020	30
CB-15	Outfall from General Wire & Cable	August 9	L 10	L 10	L 10
		October 28	1	1	-
CB- 16	Cobourg Brook at Highway 2	August 9	2,900	350	790
		October 28	5,500	164	72
CB-17	Outfall on west side of Coldsprings Creek at Elgin Street	June 24	536	288	1
		August 9	N O F L O W		
		October 28	6,300	500	40
CB-18	Coldsprings Creek at Elgin Street	June 24	3,700	260	204
		August 9	1,400	220	50
		October 28	5,700	116	36

TABLE XB - cont'd

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	TOTAL COLIFORM per 100 ml	FAECAL COLIFORM per 100 ml	FAECAL STREPTOCOCCUS per 100 ml
CB-19	Coldsprings Creek at White Street	October 28	1,700	1,400	204
CB-20	Cobourg Brook at Elgin Street	June 24	2,100	456	252
		August 9	4,000	850	730
		October 28	3,500	48	20
CB-21	Cobourg Brook tributary at Oliver's Lane	June 24	14,700	6,000	G 600
		October 28	1,700	1,400	204
CB-22	Cobourg Brook at Division Street north of Hwy. 401	June 24	552	200	180
		October 28	2,000	184	40
CB-23	Cobourg Brook at Danforth Road	June 24	608	128	100
		October 28	1,700	32	16

G = greater than

L = less than

All analyses reported in ppm.

Samples collected by:
J.A. Clarke
A.F. Leitch
A.D. McConnell

TABLE XIA - BROOK CREEK

TOWNSHIP OF HAMILTON

CHEMICAL ANALYSES

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	5-DAY BOD	SUSPENDED SOLIDS	CHLORIDE as Cl	NITRATE as N
B-1	Mouth of Brook Creek	June 15	1.2	5	22	0.18
		October 28	1.0	5	33	0.25
B-2	Culvert east side of creek north side of Lakeshore Road	June 15	0.6	5	46	2.2
		October 28	6.0	5	47	4.0
B-3	Drainage course effluent at confluence with Brook Creek	June 15	1.2	5	65	1.2
		October 28	0.6	5	66	1.1
B-4	Brook Creek above confluence with drainage course	June 15	0.6	5	18	0.13
		October 28	1.0	5	31	0.21
B-5	Brook Creek at driveway to Brook House	June 15	0.6	5	18	0.10
		October 28	1.4	25	91	2.2
B-6	Brook Creek opposite Coronation Court	June 15	0.6	5	18	0.11
		October 28	1.0	5	29	0.14
B-7	Brook Creek at Acadia Drive	June 15	0.8	5	18	0.08
		October 28	0.8	5	29	0.15

TABLE XIA - cont'd

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	5-DAY BOD	SUSPENDED SOLIDS	CHLORIDE as Cl	NITRATE as N
B-8	Tile drain on west side of Brook Creek north of Acadia Drive	June 15	0.4	10	150	4.6
		October 28	0.4	5	169	3.0
B-9	Brook Creek at Hwy. #2	June 15	0.6	5	18	0.07
		June 23	1.2	5	18	0.13
		October 28	0.6	5	29	0.17
B-10	Brook Creek opposite Thomas Street	June 23	1.0	5	17	0.13
		October 28	0.8	5	29	0.18
B-11	Storm sewer outfall from Darcy Road	October 28	1.6	5	42	0.66
B-12	Brook Creek just upstream of storm sewer	June 23	1.0	5	13	0.11
		October 28	0.8	5	27	0.15
B-13	Brook Creek at Brook Road North	June 23	1.0	5	13	0.12
		October 28	1.0	5	27	0.19
B-14	East Branch of Brook Creek approximately 500 feet south of Elgin Street East	June 23	0.8	5	5	0.15
		October 28	0.8	5	8	0.02
B-15	Brook Creek Centre Branch, at Elgin Street East	June 23	1.2	5	13	0.20
		October 28	0.8	5	29	0.26

All results reported per 100 ml of sample.

Samples collected by:
J.A. Clarke
A.F. Leitch
A.D. McConnell

TABLE XIB - BROOK CREEK

TOWNSHIP OF HAMILTON

BACTERIOLOGICAL REPORT

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	TOTAL COLIFORM per 100 ml	FAECAL COLIFORM per 100 ml	FAECAL STREPTOCOCCUS per 100 ml
B-1	Mouth of Brook Creek	June 15	5,100	2,000	148
		October 28	24,000	600	72
B-2	Culvert east side of creek north side of Lakeshore Road	June 15	44	12	77
		October 28	4,000,000	6,600	20
B-3	Drainage course effluent at confluence with Brook Creek	June 15	2,400	568	84
		October 28	10,800	80	364
B-4	Brook Creek above confluence with drainage course	June 15	2,700	476	120
		October 28	G 15,000	160	84
B-5	Brook Creek at driveway to Brook House	June 15	3,500	316	112
		October 28	14,700	452	108
B-6	Brook Creek opposite Coronation Court	June 15	3,100	280	4
		October 28	G 15,000	704	80
B-7	Brook Creek at Acadia Drive	June 15	3,200	424	208
		October 28	2,800	64	-
B-8	Tile drain on west side of Brook Creek north of Acadia Drive	June 15	24	4	1
		October 28	96	1	1

TABLE XIB - cont'd

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	TOTAL COLIFORM per 100 ml	FAECAL COLIFORM per 100 ml	FAECAL STREPTOCOCCUS per 100 ml
B-9	Brook Creek at Hwy. #2	June 15	236	236	1
		June 23	3,000	648	196
		October 28	2,900	440	116
B-10	Brook Creek opposite Thomas Street	June 23	4,500	1,100	388
		October 28	3,700	800	148
B-11	Storm sewer outfall from Darcy Road	October 28	5,400	2,100	512
B-12	Brook Creek just upstream of storm sewer	June 23	3,700	2,300	172
		October 28	3,600	460	320
B-13	Brook Creek at Brook Road North	June 23	5,100	3,500	300
		October 28	6,700	368	84
B-14	East Branch of Brook Creek approximately 500 feet south of Elgin Street East	June 23	2,100	332	416
		October 28	1,800	24	44
B-15	Brook Creek Centre Branch at Elgin Street East	June 23	4,300	2,500	276
		October 28	172	88	52

G = greater than

All analyses reported in ppm.

Samples collected by:
J.A. Clarke
A.F. Leitch
A.D. McConnell

TABLE XIIA - DISCHARGES TO LAKE ONTARIO

TOWN OF COBOURG - TOWNSHIP OF HAMILTON

CHEMICAL ANALYSES

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	5-DAY BOD	SUSPENDED SOLIDS	CHLORIDE as Cl	NITRATE as N
B-1	Mouth of Brook Creek	June 15	1.2	5	22	0.18
		October 28	1.0	5	33	0.25
LO-1	Storm drain to Lake Ontario - foot of Abbott Boulevard	August 11	0.2	5	34	0.54
		October 28	0.4	5	32	0.67
LO-2	Storm drain to Lake Ontario - opposite Bayview Crescent	August 11	0.6	10	30	1.9
LO-3	Ditch to Lake Ontario - foot of Darcy Street	August 11	0.2	5	47	0.52
		October 28	0.4	5	42	0.95
LO-4	Storm Drain to Lake Ontario - foot of Green Street	October 28	N O	F L O W		
TW-1	Mouth of Town watercourse	August 11	2.5	10	29	0.56
		October 28	2.0	5	50	0.51
LO-5	Storm sewer - manhole - Albert Street & Third Street	August 11	140	90	60	0.01
LO-6	Storm sewer - manhole - Orr Street & Hibernia Street	August 11	4.0	90	59	0.71

TABLE XIIA - cont'd

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	5-DAY BOD	SUSPENDED SOLIDS	CHLORIDE as Cl	NITRATE as N
CB-1	Mouth of Cobourg Brook	August 9	24.0	30	70	L 0.01
		October 28	50.0	60	64	0.09
LO-7	Ditch to Lake Ontario - foot of Burnham Street	August 11	0.6	5	64	10.
		October 28	N O	F L O W		

L = less than

All results reported per 100 ml of sample.

Samples collected by:
J.A. Clarke
A.F. Leitch
A.D. McConnell

TABLE XIIB - DISCHARGES TO LAKE ONTARIO

TOWN OF COBOURG - TOWNSHIP OF HAMILTON

BACTERIOLOGICAL REPORT

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	TOTAL COLIFORM per 100 ml	FAECAL COLIFORM per 100 ml	FAECAL STREPTOCOCCUS per 100 ml
B-1	Mouth of Brook Creek	June 15	5,000	2,000	148
		October 28	24,000	600	72
LO-1	Storm drain to Lake Ontario - foot of Abbott Boulevard	August 11	170	20	L 10
		October 28	2,000	12	1
LO-2	Storm drain to Lake Ontario - opposite Bayview Crescent	August 11	9,800	1,260	750
LO-3	Ditch to Lake Ontario - foot of Darcy Street	August 11	L 10	L 10	L 10
		October 28	1	1	1
LO-4	Storm drain to Lake Ontario - foot of Green Street	October 28	N O F L O W		
TW-1	Mouth of Town watercourse	August 11	230,000	7,700	6,900
			74,000	4,000	1,460
LO-5	Storm sewer manhole - Albert Street and Third Street	August 11	265,000,000	7,300,000	900,000

TABLE XIIB - cont'd

SAMPLE POINT NUMBER	LOCATION	DATE SAMPLED (1971)	TOTAL COLIFORM per 100 ml	FAECAL COLIFORM per 100 ml	FAECAL STREPTOCOCCUS per 100 ml
LO-6	Storm sewer manhole - Orr Street and Hibernia Street	August 11	340,000	10,100	25,000
CB-1	Mouth of Cobourg Brook	August 9	49,000,000	2,900,000	G 15,000
		October 28	G 150,000	G 150,000	G 15,000
LO-7	Ditch to Lake Ontario - foot of Burnham Street	August 11	8,700	160	1,100
		October 28	N O F L O W		

G = greater than

L = less than

All Analyses reported in ppm
except where indicated.

Samples collected by:
R. Barrens
R. Hicks

TABLE XIII - TOWN WATERCOURSE

TOWN OF COBOURG

SUMMARY 1959-1961 SURVEYS

SAMPLE POINT NUMBER	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	pH at Lab	CHROME	PHENOL in ppb	COLIFORM BACTERIA per 100 ml
1	Manhole at corner Orr and Hibernia Street	April 7/59	18	198	-	-	-	10,000
3	Town watercourse at Harbour	April 8/59	22	498	-	0	8	100,000
		June 15/61	1.8	42	-	-	8	43,000
8	Storm drain to Town watercourse - sampled at manhole on King Street	April 8/59	22	28	7.5	trace	20	100,000
		June 15/61	23	92	-	-	-	1,020,000
9	Town watercourse at Covert Street	April 8/59	14	40	7.6	0	0	10
10	Storm drain to Town watercourse - manhole at University Avenue and George Street	April 8/59	55	2,420	7.6	0.005	8	100
11	Town watercourse at Spencer Street	April 8/59	30	536	-	-	-	1,000
		June 15/61	2.8	30	-	-	-	2,000
12	Private drain to Town watercourse at corner of Station Street and George Street	April 8/59	14	44	-	-	-	1,000,000

TABLE XIII - cont'd

SAMPLE POINT NUMBER	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	pH at Lab	CHROME	PHENOL in ppb	COLIFORM BACTERIA per 100 ml
13	Drain from Canadian General Electric to Town watercourse	April 8/59	2.4	28	7.5	-	2	100,000
		June 15/61	3.0	18	-	-	35	255,000
		June 27/61	2.6	2	-	-	2	13,900
14	Town watercourse at Division Street	April 8/59	18	260	-	-	-	1,000
		June 15/61	1.8	36	-	-	-	320

All analyses reported in ppm
except where indicated.

Samples collected by:
R. Barrens
R. Hicks

TABLE XIV - COBOURG BROOK

TOWN OF COBOURG - TOWNSHIP OF HAMILTON

PARTIAL SUMMARY 1959 & 1961

SAMPLE POINT NUMBER	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	pH at Lab	CHROME	PHENOL in ppb	COLIFORM BACTERIA per 100 ml
CB-0.1	Cobourg Brook just above Lake Ontario	April 7/59	8	28	7.8	-	-	100,000
		June 14/61	BROKEN IN TRANSIT				8.0	22,000
		June 27/61	5.1	34	8.4	0.16	7.0	8,900
CB-0.1WS	Storm drain from Tweed Street to east bank of Cobourg Brook	March 10/59	35	380	-	-	-	1,000,000
		April 7/59	17	30	-	-	-	1,000,000
CB-0.4	Cobourg Brook at King Street	April 7/59	14	48	8.0	0.7	5	100,000
		April 14/59	11	40	-	-	-	100,000
		June 14/61	3.4	22	7.9	0.37	-	260,000
CB-0.5T	Effluent from Cobourg STP	April 7/59	210	330	8.2	0.7	-	10,000
		April 14/59	310	406	7.3	2.0	300	100,000
		June 14/61	8	16	7.9	0.6	4	62,000
		June 27/61	59	158	8.5	2.3	60	590,000
CB-0.5WS	Sanitary trunk sewer overflow to Cobourg Brook at University Avenue	April 7/59	230	606	8.5	-	-	-
			640	1,504	12.3	33	-	120
CB-0.5PS	Private drain to Cobourg Brook just north of University Avenue	March 9/59	120	140	-	-	-	1,000,000
		June 14/61	300	256	-	-	-	284,000

TABLE XIV - cont'd

SAMPLE POINT NUMBER	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	pH at Lab	CHROME	PHENOL in ppb	COLIFORM BACTERIA per 100 ml
CB-0.6	Cobourg Brook below R.R. bridge	April 7/59	3.6	18	-	-	-	100
		June 14/61	1.4	54	8.4	0.0	2	1,600
		June 27/61	1.9	14	8.4	0.07	2	54
CB-0.6PS	Drain from General Foods Limited to Cobourg Brook	March 9/59	560	38	-	-	-	100,000
		April 7/59	50	34	-	-	-	1,000
		June 14/61	0.7	18	-	-	-	42
CB-0.6D	Ditch from Harden Street to Cobourg Brook	April 9/59	6.0	72	-	-	0	100
CB-0.6P	Effluent from General Wire & Cable to Cobourg Brook - sewage discharge from General Wire & Cable to Cobourg Brook	March 9/59	5.2	6	-	-	6	10,000
		April 9/59	2.2	12	7.7	-	-	100
		June 15/61	7.0	162	-	-	-	23,000
	Process water & sewage outlet from General Wire & Cable to Cobourg Brook	June 15/61	135	28	-	-	6	2,780,000
		June 27/61	1.6	24	-	-	0	126,000
CB-1.0	Cobourg Brook at Hwy. #2	April 9/59	6	46	-	-	-	100
		June 14/61	1.2	44	8.1	0.08	0	1,440
CB-1.0PS	Private drain to Cobourg Brook at Elgin Street - S.W. side	April 9/59	26	22	-	-	-	100
CBC-1.6	Coldsprings Creek at Elgin Street	April 9/59	5	42	-	-	-	10,000
		June 14/61	1.0	20	-	-	-	1,230
		June 15/61	1.4	18	-	-	-	1,450

TABLE XIV - cont'd

SAMPLE POINT NUMBER	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	pH at Lab	CHROME	PHENOL in ppb	COLIFORM BACTERIA per 100 ml
CBC-1.6DI	Outfall from Stuart's Dairy to Coldsprings Creek	March 10/59	110	42	-	-	-	0
		June 15/61	190	156	-	-	-	8,000
CB-1.7	Cobourg Brook at Ontario Street and Elgin Street	April 9/59	2.9	6	-	-	-	100
		June 14/61	1.4	10	-	-	-	520

All analyses reported in ppm
except where indicated.

Samples collected by:
R. Barrens
R. Hicks

TABLE XV - BROOK CREEK

TOWNSHIP OF HAMILTON

SUMMARY 1959-1961 SURVEYS

SAMPLE POINT NUMBER	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	COLIFORM BACTERIA per 100 ml
21	Mouth of Brook Creek	April 8/59	12	156	1,000
		June 15/61	2.8	30	1,120
		June 27/61	0.9	18	271
20	Storm drain to Brook Creek at Hwy. 2, S.E. side	April 8/59	2.8	32	1,000
		June 27/61	2.2	8	1,260
19	Storm drain to Brook Creek at Hwy. 2, N.E. side	April 8/59	11	16	10
18	Storm drain to Brook Creek at Hwy. 2. N.E. side	April 8/59	2.8	6	100
		June 27/61	0.9	10	303
17	East branch Brook Creek above junction with west branch	April 8/59	14	226	1,000
		June 15/61	1.4	4	920
		June 27/61	1.1	8	6,300
16	Drain from Ordnance depot to Brook Creek	April 8/59	13	170	1,000
		June 15/61	1.2	-	7,000
		June 27/61	1.1	2	5,500
BC-1.1	West branch of Brook Creek at Cottesmore Avenue	April 8/59	20	198	1,000
		June 15/61	0.8	-	730
		June 27/61	0.7	6	1,100
15	Storm drain from Alexandria Drive to West branch of Brook Creek	April 8/61	7.2	20	0

All results reported
in ppm excepted where indicated.

Samples collected by:
R. Barrens
R. Hicks

TABLE XVI - OUTFALLS TO LAKE ONTARIO

TOWN OF COBOURG - TOWNSHIP OF HAMILTON

SUMMARY 1959-1961 SURVEYS

SAMPLE POINT NUMBER	LOCATION	DATE	5-DAY BOD	SUSPENDED SOLIDS	COLIFORM BACTERIA per 100 ml
1	At manhole at corner of Hibernia Street & Orr Street	April 7/59	18	198	10,000
		June 15/61	0.6	8	440
2	At manhole at corner of Albert Street & Third Street	April 7/59	150	172	10,000,000+
		June 15/61	210	310	17,000,000
4	Storm drain on Division Street at Harbour	April 7/59	30	346	1,000,000
	Manhole at corner of Albert Street & Division Street	June 15/61	115	126	41,000,000
5	Storm drain to Lake Ontario - foot of Green Street	April 7/59	N O	F L O W	
6	Ditch to Lake Ontario - foot of Darcy Street	April 9/59	2.5	10	100
7	Storm drain to Lake Ontario - foot of Abbott Boulevard	March 10/59	35	3520	1,000
		June 15/61	1.0	2	165

APPENDIX C

INTREPRETATION AND SIGNIFICANCE OF LABORATORY RESULTS

APPENDIX C

INTERPRETATION AND SIGNIFICANCE OF LABORATORY RESULTS

The analyses employed to assess the water quality of the samples collected during this survey were: Biochemical Oxygen Demand (BOD), Suspended Solids (SS), Nitrates (N), Chlorides (Cl), and the determinations of total and faecal coliform organisms and faecal streptococcus organisms.

BACTERIOLOGICAL EXAMINATION

The bacteriological indicators of contamination used during this survey were the total and faecal coliform organisms and the faecal streptococcus organisms. Coliform organisms are most commonly found in human and animal excrement but they can also be found in soil. They are always present in large numbers in untreated sewage and are in general relatively few in number in other stream pollutants. The faecal coliform and faecal streptococcus organisms are more selective indicators of pollution. The faecal coliform are indicators of human or animal wastes. Several investigators have found the relationship between the number of faecal coliforms and the number of faecal streptococcus present in a sample and the source of the waste being examined. It has been found that in wastes from humans there are a greater proportion of faecal coliforms than faecal streptococcus. It has been suggested that if the ratio of faecal coliform to faecal streptococcus is 4:1 or greater, the faecal coliform bacteria are from human wastes. When wastes from known animals are examined the results show that ratio of faecal coliforms to faecal streptococcus is usually 0.7 or less.

The Membrane Filter (MF) technique was employed to obtain a direct enumeration of organisms for total coliform organisms (TC), faecal coliform organisms (FC) and faecal streptococci organisms (FS).

SANITARY CHEMICAL ANALYSES

Biochemical Oxygen Demand (BOD)

This test evaluates the loss of dissolved oxygen that accompanies the decomposition of organic matter carried out by organisms. It is an indirect measure of the amount of decomposable matter present and the direct measure of the respiratory oxygen requirement of the living organisms responsible for decomposition. A 5-day BOD determination with incubation at 20°C is reported. A high BOD is indicative of organic or chemical pollution. In most cases adequate protection for surface waters should be provided if BOD concentrations in storm sewers, sewage treatment plants and industrial waste discharges do not exceed 15 ppm, but in some cases a much higher concentration can be tolerated while in other cases a concentration less than 15 ppm could be detrimental. Special situations have to be examined individually. This will ensure that the biochemical oxygen demand from the various sources does not lower the oxygen concentration in the watercourse below 6 - 7 mg/litre and thus make the watercourse unacceptable for various fresh water biota.

Solids

The total solids determination is the sum of the values of suspended solids and dissolved solids. The suspended solids value is the most significant of the solids determination and indicates the measure of the undissolved solids of organic or inorganic nature. The effects of suspended solids in water are reflected in difficulties associated with water purification, depositions in streams and injury to the habitat of fish. In most cases, adequate protection for surface waters should be provided if suspended solids concentrations in storm sewer discharges, sewage treatment plant discharges and industrial waste discharges do not exceed 15 ppm.

Nitrates

Nitrate is the end product of aerobic decomposition of nitrogenous matter. Nitrates occur in the crust of the earth in many places and are a source of its fertility. Although there are many sources of nitrates, they are rarely abundant in natural surface waters since they are essential fertilizers for all types of plants. The following ranges in concentrations may be used as a guide: Low, less than 0.1 ppm; moderate, 0.1 to 1.0 ppm; high, greater than 1.0 ppm.

Chlorides

Chlorides are found in most natural waters. They may originate from (1) natural minerals, (2) sea water contamination, ground water, (3) agricultural practices, (4) human and animal sewage and (5) industrial effluents. A sudden increase in the chloride concentrations of the water supply may indicate pollution. Any effluent having an excessive concentration of chlorides should be investigated for possible contamination by sanitary or industrial wastes.

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